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Bibliography on Tornado Analysis and Forecasting

February 1959 No. 2

METEOROLOGICAL ABSTRACTS AND BIBLIOGRAPHY

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METEOROLOGICAL ABSTRACTS AND BIBLIOGRAPHY

MALCOLM RIGBY, Editor

Vol. 10 FEBRUARY 1959 No. 2

SPECIAL FEATURE IN THIS ISSUE

Bibliography on Tornado Analysis and Forecasting

By
Geza Thuronyi

(*For complete table of contents see back cover*)

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FOREWORD

Meteorological Abstracts and Bibliography is a monthly publication whose purpose is to bring to the attention of meteorologists current literature in their field.

Part I contains abstracts of current literature in the fields of meteorology, etc.

Part II of each issue comprises an annotated bibliography of important references on a special subject (usually arranged chronologically).

Bibliographies published in the successive issues were:

Vol. I, 1950

1. Atmos. Pollution	2. Aerobiology	3. Cloud Physics	4. Hail
5. Tornadoes	6. Volcanic Dust	7. Climat. Changes	8. Thunderstorms
9. Icing	10. Acoust. Propagation	11. Evaporation	

Vol. II, 1951

1. Extended Forecast.	2. Long Range Forecast.	3. Soil Temp.	4. Constants, etc.
5. Clim. of Near East	6. Clim. of Middle East	7. Special Winds	8. Radar Storm
9. Condensation Trails	10. Clim. of N. E. Africa	11. Mountain Met.	Detect.

Vol. III, 1952

1. Clim. of N. W. Africa	2. Carbon Dioxide	3. Clim. of Argentina, etc.	4. Dew
5. Objective Forecast.	6. Stratus Forecast.	7. Urban Climatology	8. Clim. of C. Africa
9. Visibility	10. Glaze and Rime	11. Free Air Turbulence	

Vol. IV, 1953

1. Turbulence Theory	2. Turbulent Diffusion	3. Frost	4. Clim. of Australia, etc.
5. High Level Winds	6. Winds in Stratosphere	7. Jet Stream	8. Radiation Bioclim.
9. Clim. of Pacific	10. Auroras	11. Sferics	

Vol. V. 1954

1. Oceanog. Met.	2. Clim. of S. E. Asia	3. Auroral Physics	4. Tropopause
5. Balloons	6. Numerical Forecast.	7. Radiation Data	8. Vertical Motion
9. Clim. of Arctic	10. Industrial Met.	11. Wind Waves and Swell	

Vol. VI, 1955

1. Bibliog. of Bibliog.	2. Texts & Monogr. Bibliogs.		3. Storm Surges
4. Ionospheric Prop.	5. Photochem.—Upper Atmos.		6. Cloud Physics
7. Radar Cloud Physics	8–9. Atmos. Nuclei	10. Weather Modification	11. Cooling Power

Vol. VII, 1956

1. Synoptic Met.-Arctic	2. Clim. of Enclosed Spaces	3. Cosmic Rays (–1952)
4. Cosmic Rays (1953–56)	5. Atmos. Radioactivity	6. Inversions
7. Snow Micromet.	8. Snow Micromet. (Suppl.)	9–11. Tropical Cyclones

Vol. VIII, 1957

1. Solar Weather Relations	2. Night Airglow	3. Forecasting Special Elements
4. Forest Micrometeorology	5. Hydromet. Forecasting	6. Numerical Forecast. (Suppl.)
7. Albedo 8. Meteors	9–10. Tropospheric Prop.	11. Medical Meteorology

Vol. IX, 1958

1. Radioastronomy	2. Solar Astrophysics	3. Radioactivity in Atmosphere
4. Waves and Currents	5. Physical Oceanog.	6. Dynamic & Phys. Oceanog.
7. Long Range Forecast.	8. Radar Met. 9. Cosmic Rays	10–11. Geomagnetism

Vol. X, 1959

1. Works of C. E. P. Brooks	2. Tornado forecasting	3. Soil Moisture

Other bibliographies in preparation are:

Actinometers	*Micrometeorology*	*Singularities*
Frost	*Ozone*	*Synoptic Aerology*
High Atmosphere Temperatures	*Radiation*	*Thunderstorms*

Part III contains a listing of reviews, translations, reprints, and the contents of important publications. These are published in the earliest issue where space permits.

Part IV is made up of author, subject and geographical indexes. The December issue comprises cumulative author, subject, geographical and journal indexes.

EXPLANATIONS

Location of material: For each entry, a symbol is given for at least one library where the material may be found. The Union List of Serials (Gregory) is the source of most of the symbols used. In some cases, where no symbol has been assigned to a library, one will be devised according to the principles of the Union List.

Library symbols used frequently may be found in the following list:

DA:	U. S. Dept. of Agriculture Library, Washington, D. C.
DBS:	U. S. Bureau of Standards Library, Washington, D. C.
DGS:	U. S. Geological Survey Library, Washington, D. C.
DLC:	Library of Congress, Washington, D. C.
DN-HO:	U. S. Navy Hydrographic Office Library, Suitland, Md.
DNLM:	U. S. National Library of Medicine, Washington, D. C.
DWB:	U. S. Weather Bureau Library, Washington, D. C.
GB-MO:	Great Britain, Meteorological Office Library, Harrow, England.

Other symbols:

*	before an entry indicates a good data source.
†	before an entry indicates a good bibliography.
§	before an entry indicates a synoptic case history study accompanied by charts.

Geographic locations are in the English form rather than the form used locally, for example, Moscow for Moskva.

Titles of articles or monographs are in the language of the original article unless otherwise stated. Slavic (Cyrillic) titles are transliterated into the Roman alphabet according to the Library of Congress transliteration scheme.

Abbreviations:

Titles of periodicals are not abbreviated, as a rule.

The months of the year from March to July are not abbreviated. Other months are abbreviated as Jan., Feb., Aug., Sept., Oct., Nov., and Dec.

The word or abbreviation for Volume (Tom, Band, Jahrgang, Año, etc.), for Number (Heft, Fascicule, Vypusk, etc.) and for page or pages is omitted from most entries. Thus an entry will read as follows:

Meteorologische Rundschau, 2(5/6):146–151, May/June 1950.

This indicates that the article appeared in *Meteorologische Rundschau, Jahrgang* 2 (Vol. 2), *Heft* 5/6 (No. 5/6), *pages* 146–151, May/June 1950.

PART I. ABSTRACTS OF CURRENT METEOROLOGICAL MATERIAL

MAJOR GENERAL WORKS

TEXTBOOKS

10.2–1 551.5(02)

Roulleau, J. and Trochon, R., **Météorologie générale, II.** [General meteorology, Vol. 2.] Paris, Gauthier-Villars, **1958.** 178 p. 84 figs., 77 tables, numerous eqs., bibliog. p. 171–173. (*Monographies de Météorologie.*) **DWB** (M R859m)—This work is a continuation of a first volume published in 1952 (*see* 5.4–3, April 1954, *MAB*), which dealt with the structure of the atmosphere and with radiation phenomena. Vol. 2 consists of 9 chapters which cover: 6) Thermodynamic transformations in the atmosphere; 7) Starting and maintenance of vertical motions. Vertical stability and instability; 8) Equations of atmospheric motions; 9) Motion, in steady state, in the free atmosphere; 10) Atmospheric turbulence; 11) Condensation of atmospheric water vapor; 12) Clouds and fogs; 13) Constitution of clouds and fogs; 14) Precipitation. Contrary to the first volume, in which the authors described the vertical structure of the atmosphere, taking no notice of its internal motions, Vol. II takes notice of these motions. The thermodynamic transformations which accompany the vertical and the horizontal motions of the atmosphere are correctly explained. The wind is easily defined through the equations of motion, as well mathematically, as for its physical manifestations through its speed and its direction. After having reviewed the generalities concerning turbulence, Ch. X deals with wind turbulence and an introduction to the statistical turbulence theory. An account of the various means of cooling an air particle and of the physical mechanisms of condensation precedes the morphological classification of clouds (their formation and transformation). In the chapter relative to the constitution of clouds and fogs, the authors determine the scale of sizes for the different parameters which define the state of the cloud and which interfere in its evolution. Ch. XIV, finally, summarizes the whole of our knowledge concerning precipitation. *Subject Headings:* **1. Thermodynamics of the atmosphere 2. Stability 3. Atmospheric turbulence 4. Condensation of water vapor 5. Cloud physics 6. Meteorology textbooks.**—*A. V.*

10.2–2 551.579(02)

*†Dębski, Kazimierz, **Hydrologia kontynentalna, Pt. 1, Hydrometria.** [Continental Hydrology, Pt. 1, Hydrometry.] *Poland. Panstwowy Instytut Hydrologiczno-Meteorologiczny, Ser. A, Instrukcje i Podreczniki,* No. 31, issued Warsaw, **1955.** 403 p. 284 figs., 36 tables, bibliog. p. 399–403. **DLC** (GB661.D37)—In this detailed text, hydrological instruments used in Poland and other countries are described and shown in diagrams, and methods of measurement and computation are explained. After an introductory section in which networks, activities and publications of the Polish hydrological and hydrometeorological services are discussed, the author takes up the construction and use of river gages, sounding instruments, current meters, ground water instruments, rain gages, evaporimeters and thermometers. Ch. 16–18 (p. 343–398) are of particular meteorological interest. They deal with atmospheric precipitation and its observation; the Polish precipitation network; various types of precipitation gages and their operation; analysis of precipitation data (an average rainfall chart of Poland is presented); evaporation and its direct (evaporimeters, lysimeters) and indirect determination; evaporation from snow; atmospheric pressure, humidity and wind; and atmospheric and soil thermometry. *Subject Headings:* **1. Hydrology textbooks 2. Hydrological measurement.**—*G. T.*

10.2–3 551.579:62(02)

†Butler, Stanley S. (*Univ. of Southern Calif.*), **Engineering hydrology.** Englewood Cliffs, N. J., Prentice-Hall, **1957.** 356 p. figs., tables, foot-refs., eqs. **DWB** (M79 B9868en), **DLC**—

A modern textbook on quantitative or engineering aspects of surface and ground water hy drology, dealing mainly with flood or high water and low water runoff. Separate chapte cover: 1) hydrologic cycle, 2) precipitation; 3) snow melt; 4) analysis of precip. data (mas curves, intensity, duration curves, maximum probable storm); 5) ground water; 6) infiltratio 7) hydraulics of wells; 8) application of well hydrology; 9) stream flow data; 10) analysis runoff data; 11) net storm rain; 12) peak discharge and flood runoff. A good glossary an index are appended. Numerical problems are added to each chapter and the text is full nomograms, diagrams, data, etc. Instruments, observations and analysis of data are stressed *Subject Headings:* **1. Engineering hydrology textbooks 2. Hydrometeorology textbook 3. Snow melt hydrology 4. Net storm rainfall.**—*M.R.*

10.2–4 551.5:551.46(0

Briones Viejobueno, José Luis de, **Oceanografía para meteorologos.** [Oceanography f meteorologists.] *Spain. Servicio Meteorológico Nacional, Publicación, Ser. B (Textos)*, No. **1958.** 131 p. 19 figs., tables, refs. (p. 5), eqs. **DWB, DLC**—An elementary college cours or text in oceanography for meteorologists, consisting of seven chapters: I. Meteorology oceans and ocean currents, II. Physical properties of sea water, III. Energy balance of the se IV. Interaction of air and sea, and effect of ocean on climate, V. Effect of wind on the current VI. Effect of wind on the waves and VII. Worldwide and Spanish services for marine meteo ology and wave forecasting. Appended are various oceanographical or marine meteorologic tables. *Subject Headings:* **1. Marine meteorology textbooks 2. Oceanography for me teorologists.**—*M.R.*

10.2–5 551.5:629.12(0

§Viaut, A., **La météorologie du navigant.** [Meteorology for aerial navigators.] Ne rev. ed. Paris, Blondel la Rougery, **1956.** 284 p. figs., charts, photos, tables. **DW** (M:629.12 V623m)—About 25 pages of additional material have been added to the 194 edition of this most thorough text on aeronautical meteorology. The portions which de with international aero-meteorological matters have been brought up to date. The bas chapters are on: atmospheric structure, pressure, temperature, wind, humidity, instabilit and turbulance, aeronautical instruments and equipment, upper air, maps and diagram circulation, vertical motions, clouds, air masses, fronts, dangerous phenomena, network forecasts, and reports and service to pilots. Large colored surface, 500, 300, cloud system an air mass charts of Northwest Europe and the North Atlantic for remarkable cyclonic situatio in 1955 and 1949 are appended. (For abstract on 1949 edition, *see* 3–9, March 1950, *MAB Subject Heading:* **1. Aeronautical meteorology textbooks.**—*M.R.*

10.2–6 91(02) 551.

Ekblaw, Sidney (*Univ. of Kansas City, Mo.*) and Mulkerne, Donald J. D. (*N. Y. Sta College for Teachers, Albany*), **Economic and social geography.** N. Y., McGraw-Hill, 195 415 p. photos, figs., maps. **DWB** (330.9 E36ec), **DWC**—The approach to world econom and social geography in this text (evidently intended for Junior High or Secondary school us is by way of climatic regions. Environment (Ch. 2) and climate (Ch. 3) are discussed in Pt. as separate subjects and then briefly in the sections on life and work in the tropics (Pt. II in the subtropics (Pt. III), in the middle latitudes (Pt. IV) and in the high latitude (Pt. V The chapter on climate discusses the significance of climate to people (health and energ homes and activity, agriculture and transportation and climatic regions on which the remaind of the text is based) and conditions of atmosphere determining weather and climate (tem pressure, winds, humidity, cloud and sunshine, and precip.). At the end of each chapter a very elementary questions, projects and map work and group activity suggestions. *Subj Headings:* **1. Geography textbooks 2. Regional climates 3. Climatic regions.**—*M.R.*

10.2–7 91(02) 551.

Finch, Vernor C.; Trewartha, Glenn T.; Robinson, Arthur H. and Hammand, Edwin (*all, Univ. of Wisc.*), **Physical elements of geography.** 4th ed. N. Y., McGraw-Hill, 195 541 p. figs., photos, tables, refs. **DWB** (551 F842ph), **DLC**—The first major section (p. 2 207) of this substantial standard college text on physical geography covers the elements

imate and climatic types. Separate chapters cover: air temp. and sunshine, pressure and inds, humidity and precip., air masses and fronts and disturbances; and tropical humid, ry, humid mesothermal, humid microthermal and polar climates. Thus almost 40% of the ext has to do with climate (for an even fuller treatment by one of the authors, *see* 5.9–12, **n introduction to climate** by TREWARTHA). The material on physical geography comprising ie present edition has been brought up to date by addition of a number of recent synoptic iarts, illustrations, bibliographic references and textual changes. Climatic data for selected ations in the various "Zones" are appended along with color charts of the world showing verage annual precip. and modified Köppen climatic regions. *Subject Headings:* **1. Geography extbooks 2. Climatology.**—*M.R.*

10.2–8 551.553.21(02)

*†Pédelaborde, Pierre (*Faculté des Lettres de Toulouse*), **Les moussons.** [Monsoons.] aris, Librairie Armand Colin, **1958.** 208 p. 36 figs., tables, foot-refs., bibliog. p. 194–204. *Collection Armand Colin*, No. 325.) **DWB** (M53.21 P371mo). Review in *La Météorologie*, aris, No. 50, April/June **1958. DWB**—This little book is arranged in two parts with 3 iapters in each part. Pt. I goes into the mechanism of monsoons in general: 1) theories, characteristics of intertropical circulation and 3) dynamics of intertropical circulation. t. II takes up the actual Asiatic monsoons: 1) the Japanese monsoon, 2) the Malayan monsoon id 3) the Indian Monsoon. The conclusion goes into "pseudo monsoons" of other parts the world. An extensive bibliography takes up regional and subject-wise aspects in detail ccording to the chapter and sub-chapter headings. *Subject Headings:* **1. Monsoons 2. Tropal meteorology textbooks 3. Textbooks on monsoons.**—*M.R.*

10.2–9 551.594(02)

†Kilinski, Erich von (*Potsdam Observatory*), **Lehrbuch der Luftelektrizität.** [Textbook of mospheric electricity.] Leipzig, Geest und Portig, **1958.** 140 p. 68 figs., 16 tables, 110 fs., eqs. **DLC** (QC961.K5)—A thorough technical textbook covering: A) conductivity of e atmosphere and ions, B) The atmospheric electric field, C) electrical currents in the atosphere and D) cloud and thunderstorm electricity. Under these four headings there are chapters and 49 sub-chapters, taking up every conceivable aspect of this broad subject om a theoretical and an observational point of view. An extensive bibliography and name uthor) and subject index are appended. References cover literature from FRANKLIN (1752) 1958. The work is well illustrated with small photographs or schematic diagrams. *Subject eadings:* **1. Atmospheric electricity textbooks 2. Atmospheric conductivity 3. Thunderorm electricity.**—*M.R.*

10.2–10 551.521.64(02)

†Dorman, Leĭb Issakovich, **Variatsii kosmicheskikh lucheĭ.** [Variation of cosmic radiaon.] Moscow, Gosud. Izdat. Tekhniko Teoreticheskoĭ Literatury, **1957.** 402 p. 252 figs., arts, 29 tables, 323 refs., numerous eqs. **DLC** (QC485.D6)—A thorough and detailed eatment of the many phases of cosmic radiation theory and observation, based on the rich erature of all countries through 1957. Emphasis is placed on variations and their explanation terms of geophysical and astrophysical phenomena such as the solar corpuscular stream the magnetic pull of the earth, sun, or galaxy; intended for students and research workers cosmic ray physics, astrophysics, geophysics and meteorology and for technicians at IGY tions. Various chapters cover experimental methods and equipment for observing c.r. riations; statistical methods of research on c.r. variations; determination of primary and condary variations, meteorological influences (p. 97–156); solar diurnal variations (p. 157–8); interpretation of solar-diurnal variations within the atmosphere (p. 199–244); magnetic orm effects on correlations (p. 245–284); solar corpuscular current effects (p. 285–342); eat c.r. storm of Feb. 23, 1956 (p. 391–437); and origin of c.r. (p. 438–455). In the appendix e: (1) table of world-wide net of c.r. IGY stations; (2) a map of same; (3) BRUNBERG's e 5.3–323, March 1954 and 5.8–283, Aug. 1954, *MAB*) diagrams for determining trajectory c.r. particles from space to earth at various places; (4) density-temp.-coeff. graphs; and change of intensity of c.r. at 36 stations on Feb. 23, 1956. The latter phenomena is very

thoroughly covered in the chapters cited above. *Subject Headings:* **1. Cosmic ray variations 2. Cosmic ray storm, Feb. 23, 1956 3. Cosmic ray textbooks.**—*M.R.*

10.2–11 537.2(02) 551.594.21

†Loeb, Leonard B. (*Univ. of Calif., Berkeley*), **Static electrification.** Berlin, Springer-Verlag, **1958.** 240 p. 63 figs., refs. by ch., p. 221–224. Price: DM 48. **DLC** (QC573.L6)—In the 5 detailed chapters of this book, the broad field of static electrification by 1) electrolytic processes, 2) by spray electrification 3) by ionization of gases are treated in Ch. I, III and V respectively. Ch. II and IV cover the contact potential difference or volta potential and mechanisms of electrification on solid-contact, respectively. Of interest to meteorologists are the sections on the WORKMAN-REYNOLDS freezing potential (p. 25–31), potential at a water-air interface (p. 61–74), spray-electrification and thunderstorm electrification (p. 80–100), electrification of dust (p. 136–149), ionization (p. 201–214), thunderstorm electrification and lightning protection (p. 215–221). *Subject Headings:* **1. Static electrification 2. Thunderstorm electrification.**—*M.R.*

10.2–12 551.5(02)

Petterssen, Sverre, **Introduction to meteorology.** 2d ed., N. Y., McGraw-Hill, **1958.** 327 p. 213 figs. (some fold.), 14 tables, 34 refs. **DLC** (QC861.P4 1958)—A complete revision, after 17 years, of the famous 1941 elementary college text on meteorology, written for the wartime training schools, but now useful for beginners in professional courses in meteorology, or for geography, agriculture, industrial or aviation students who wish to understand the weather and climate. Advanced physical meteorology and synoptic forecasting have been deliberately avoided and little mathematics is employed. The main chapters cover the atmosphere, instruments and observation, clouds and precipitation, cloud physics, heat and temperature changes, radiation and heat exchange; showers, thunderstorms, hail and tornadoes; haze, mist, smog and fog; the laws of motion, local wind systems; general circulation; air masses; fronts and frontogenesis; cyclones and anticyclones; tropical storms, temperature regimes; precipitation regime; world climate and simple weather lore and forecasting. Nearly all of the illustrations and references are of recent vintage. *Subject Heading:* **1. Meteorology textbooks.**—*M.R.*

10.2–13 551.509.312(02)

Kibel', Ivan Afanas'evich, **Vvedenie v gidrodinamicheskie metody kratkosrochnogo prognoza pogody.** [Introduction to hydrodynamic methods of short range weather forecasting.] Moscow, Gos. Izd-vo Tekhniko-Teoret. Lit-ry, **1957.** 375 p. 98 figs. (some folded), foot refs., numerous eqs. **DLC** (QC995.K5) 2000 copies—This is the long-awaited text on hydrodynamic methods of shortrange forecasting by the renowned author and teacher of single station numerical weather forecasting. More advanced theoretical texts have been published by KOCHIN, KIBEL' and ROZE (*see* 6.5–7, May 1955 and 9.11–7, Nov. 1958, *MAB*) and by BELINSKIĬ (*see* 9.10–6, Oct. 1958, *MAB*), but this is the first standard text on hydrodynamic numerical prediction and is written by an authority. The twelve (12) chapters which are replete with both theory and with illustrative diagrams and synoptic charts are concerned with: (1) boundary layer problems of the atmosphere, (2) hydrodynamic and thermodynamic equations applied to the free atmosphere, (3) the order or scale of atmospheric motions, (4) setting up the equations for forecasting and relating motions to the geostrophic, (5) forecasting for mid-tropospheric levels (various models and linearization problems), (6) extrapolation of linear or quasisolenoidal equations for forecasting, (7) basic prognostic equations, use of Green's function for transformation of meteorological parameters with time and for vertical motions (geopotential), (8) non-linear forecast problems for mid-levels and use of electronic-computers, with various models used in USSR and abroad, (9) extrapolation of non-linear equations and solution by electronic computers, (10) frontal zones and frontal surfaces solenoidal movements, (11) orographic and frictional effects, (12) thermal transformations and forecasting for the stratosphere. Synoptic applications are as a rule for Europe or Eurasian sectors of the Northern Hemisphere 500 mb charts, but sometimes for 700 mb. References are to the major works of Soviet and Western authors. *Subject Headings:* **1. Numerical forecasting textbooks 2. Hydrodynamic short range forecasting.**—*M.R.*

10.2–14 551.509.2/3(02)

†§Khromov, Sergeĭ Petrovich, **Osnovy sinopticheskoĭ meteorologii.** [Basic synoptic eteorology.] Leningrad, Gidrometeoizdat, **1948.** 696 p. 277 figs., 6 fold. charts, tables, bliog. p. 684–696. **DWB, GB-MO**—A most satisfactory and systematic general textbook n synoptic meteorology, analysis and forecasting (short range, specialized and extended recasting) which has not been outdone in the past decade. The 1948 ed. has several chapters hich were not in the 1934 and 1937 editions (**Vvedenie v sinopticheskiĭ analiz**), or the 1940 dition (**Sinopticheskaia meteorologiia**). In the 1948 ed., V. A. Bugaev is responsible for aragraphs 12 to 18, 26 and 74 and parts of 29, 30, and 70, and helped the author write para- aphs 19 and 20. N. L. Taborovskiĭ wrote paragraph 59 and parts of 31, 51, 57, 70, 71, 72 nd 73; and A. S. Zverev, paragraphs 75, 78, 79, and 80; and G. Ia. Vangengeim and B. L. zerdzeevskiĭ, paragraph 85. The book is arranged in 10 main parts (90 paragraphs): Introduction (paragraphs 1–4) covering history, methods, structure and concepts; 2. Tools r synoptic analysis (paragraphs 5–21) covering reports, charts, errors, methods of analysis complex charts, aerological diagrams, cross sections, isentropic charts; 3. Basic fields and ind (paragraphs 22–31); 4. Air masses (paragraphs 32–38); 5. Fronts (paragraphs 39–47); Cyclonic activity (paragraphs 48–59); 7. General circulation (paragraphs 60–69); 8. Fore- sting synoptic situations (paragraphs 70–75); 9. Forecasting weather (paragraphs 76–83); . Large scale weather and long range forecasting (84–90). (For abstract on this chapter, e 2A–29, Jan. 1951, *MAB.*) Literature through 1947 is covered in a bibliography (arranged chapters) which refers to basic native and foreign texts and monographs in good perspective. *See also* 10.1–63, Jan. 1959, *MAB.*) *Subject Heading:* **1. Synoptic meteorology textbooks.** *M.R.*

MONOGRAPHS AND COMPREHENSIVE PAPERS

See also: **Tables and nomograms on physical constants for air** (Kaeppeler, Krause), 10.2–154; **Catalytic composition of NO** (Riesz et al.), 10.2–162; **Upper atmos. research,** 10.2–164.

10.2–15 551.509.31(99)

§Mansfield, A. W. and Glassey, S. D., **Notes on weather analysis in the Falkland Islands ependencies, Antarctica.** *Falkland Islands Dependencies Survey, Scientific Reports,* No. 16, **57.** 27 p. 12 figs., 6 tables, 29 refs. **DWB** (919.9 M287no)—A thorough monograph on) the atmospheric circulation of the Southern Hemisphere, south of 45°S. lat., air masses d their transformation, frontogenesis, methods of analysis and observational material, and) the weather of South Georgia with special reference to King Edward Point, Cumberland, st Bay. In the latter section the Antarctic, Polar and Tropical Maritime air masses, the nd, temperature, frontal effects and standing waves are treated, and dynamic, thermody- mic and synoptic peculiarities are discussed and illustrated with sample synoptic charts, ermograms, data tabulations and aerological cross sections. *Subject Headings:* **1. Antarctic noptic analysis 2. Southern Hemisphere air masses 3. South Georgia region.**—*M.R.*

10.2–16 551.510.42(73)

†*Interstate Sanitation Commission, **Smoke and air pollution, New York, New Jersey. report by the Interstate Sanitation Commission (of) New York, New Jersey (and) Con- cticut on a Study of Smoke and Air Pollution in the New York Metropolitan area.** Feb. **58.** 95 p. 40 figs. (incl. photos), 17 tables, 64 refs. DWB (M10.42 I613sm)—This tractive monograph gives the details of the study of pollution in the New York-New Jersey ea which was made in the summer and fall of 1957 by the Interstate Sanitation Commission th the aid of the Public Health Service, the U. S. W. B., the U. S. Army Chemical Corps d the U. S. Bureau of Standards. The project was planned and directed by Louis C. Mc- BE. Conclusion was that air pollution in the area was interstate in character, adversely ects public health and comfort and damages property. Sources of the pollution, types of llution, agencies active in control, legislation, early investigations (since 1932), recent more tailed surveys (1944–56), data therefrom, comparison with other cities, monthly variations, alysis of condensation from the air in New York and vicinity in Oct. 1957, meteorology and natology (Ch. VI, p. 50–62), tracer studies of dispersal patterns, etc., effects on health,

vegetation and property and on communities in the Greater New York area are discussed an illustrated by fine photos, maps, diagrams, graphs, tables, etc. in separate chapters. *Subje Headings:* **1. Air pollution survey, New York area 2. New York-New Jersey area.**—*M.R.*

10.2–17 551.513.2:551.557.5:01

*†Berggren, R.; Gibbs, W. J. and Newton, C. W., **Observational characteristics of the je stream: a survey of the literature. Report of a working group of the Commission for Aerolog (of the World Meteorological Organization).** *World Meteorological Organization, WM (Publication)*, No. 71.TP.27; Technical Note, No. 19, **1958.** 102 p. figs., and photos, bibliog p. 63–102. **DLC.** Review by C. W. Newton in *World Meteorological Organization, WM Bulletin*, 7(3):122–123, July **1958. DWB**—A thorough review of the vast literature (1904 1957) on the jet stream or high level wind maximum, with special reference to its structu and behavior as deduced from observations rather than theory or prediction. The temperatu field and its relation to the wind and pressure field, the mean circulation and climatology of th jet stream, availability and treatment of data, the 5 main areas of occurrence (equatorial N and S. Hemisphere, subtropical and the polar jet streams); relation to synoptic systems (larg scale, cyclones, surface fronts and deep frontal layers); horizontal profiles through jet strea (wind shear and vorticity); multiple jets profiles from aircraft reconnaissance, vertical varia tions, turbulence and clouds in relation to jet stream, and finally navigational aspects a discussed and illustrated with cross sections, contours, mean zonal charts, streamlines an isotachs, profiles, isothermal charts, cloud photos, etc. The most extensive and comple bibliography of nearly 600 references, which covers theoretical and forecasting as well observational aspects of the jet stream, is derived to a great extent from special bibliographi on jet stream, tropopause, turbulence, and high level winds in *MAB*. References are mad where applicable, to *MAB* abstract numbers (through Vol. 8, No. 8, Aug. 1957). *Subje Headings:* **1. Jet stream characteristics 2. Jet stream bibliographies.**—*M.R.*

10.2–18 551.508.8 551.510.

†Marshall, J. S. (*McGill Univ.*) and Gordon, W. E. (*Cornell Univ.*), **Radiometeorolog** *Meteorological Monographs* (American Meteorological Society), Boston, 3(12–20):73–113, Ju **1957.** 26 figs. (incl. photos), 5 tables, bibliog. p. 109–113, eqs. **DWB, DLC**—In this revie of developments in radio meteorology during the five year interval 1951–1955, the autho discuss the following subjects: sferics systems including the goniometer and cathode ra direction finder, recent research in atmospherics (the use of sferics in detecting tornado wave forms of sferics, etc.); radio field strength beyond the horizon, radio scattering by turbulent atmosphere, internal reflection of the atmosphere for radio waves, the refracti index of the atmosphere for radio waves, synoptic weather and radio propagation, and optic paths; the precipitation patterns observed by radar including displays of rain-shower cel snow generating cells and trails, meso-scale pattern, tornadoes and hail, synoptic scale ph nomena and hurricanes; theoretical and specialized studies in weather radar such as t weather radar equation, size distribution and the correlation among precipitation parameter shape coating and polarization of hydrometeors, attenuation, reflectivity as a function of du and pollen, the bright band, cloud observation by radar, and angels and lightning. *Subj Heading:* **1. Radio meteorology.**—*I.L.D.*

10.2–19 551.510.42:535.

*Megonnell, William (*Community Air Pollution Program, Robert A. Taft Sanitary En Center, Cincinnati*), **Interstate atmospheric transport of tracer particles in N. Y.-N. J. metr politan area. A report to the Interstate Sanitation Commission of New York, New Jers and Connecticut on investigations conducted in cooperation with the Commission as part the New York-New Jersey Interstate Air Pollution Study, 1956–1957.** *U. S. Robert A. T Sanitary Engineering Center, Technical Report* A58-6, Jan. **1958.** 95 p. 22 figs., 3 tab 6 refs.—Details of the organization, operation and technical problems connected with a surv of atmospheric pollution dispersal from industrial plants by means of the fluorescent parti tracer technique. The reported program for the New York-New Jersey area is thought to the first such application to a large metropolitan area. Fluorescent zinc cadmium sulfide w released in one state and recovered in the other and vice versa during May–Nov., 1957. Dur

inversion (4°F from surface to 900 ft) the recovery of the tracer was much higher than during ninversion conditions, at least 5% of the tracer travelling across Staten Island within 6 ft the ground. Topographical influences were noticeable. Meteorological aspects, forecasts, tworks, methods and results are given in some detail with charts showing results of various ns. It was concluded that pollutants are definitely carried across state boundaries in both rections. *Subject Headings:* **1. Air pollution transport 2. Fluorescent tracer technique New York-New Jersey area.**—*M.R.*

10.2–20 551.556.2:551.584

†Caborn, J. M. (*Dept. of Forestry, Edinburgh Univ.*), **Shelterbelts and microclimate.** *reat Britain. Forestry Commission, Bulletin*, No. 29, **1957.** 135 p. 52 figs., 28 plates, tables, bibliog. p. 130–134. **DWB** (634.9 G786bu)—An unusually thorough and well ocumented monograph on all aspects of shelter belts: history, influence on wind, temp., midity, evaporation and transpiration, soil moisture, precip., snow cover; economics, yout and structure, research methods, with application to Great Britain; instrumentation, perimental techniques, field investigations, laboratory investigations, future developments, tual results of research, plus an extensive bibliography and glossary. Such details as the fect of the length of the shelter belt and the sheltered area, wind conditions at the extremes the belt, effect of a gap, vertical variations to the leeward, effects of a series of parallel belts, fects on wind erosion, heat exchange, etc. are discussed and illustrated by numerous graphs, agrams and tables. *Subject Heading:* **1. Shelter belt microclimatology.**—*M.R.*

10.2–21 551.573:016

†Van der Bijl, Willem, **Evapotranspiration problem: first contribution.** *Kansas. State llege, Manhattan. Dept. of Physics, Report*, **1956/1957.** 94 p. figs., tables, 46 refs., eqs. **WB** (M73 K1bre)—A thorough review of the history, literature, methods and data on the bject of evaporation and evapotranspiration, beginning with DALTON's work in 1802, bulating frequencies of articles on the subject in LIVINGSTON's (1908–9) excellent bibli- raphy on evaporation (*see* K–1, Nov. 1950, *MAB*) and the one by H. P. KRAMER (1950) *MAB*, vol. 1, p. 733–762). Nomograms for determining evaporation and evapotranspiration cording to formulas of THORNTHWAITE, RYKOORT-KRAMER method for PENMAN's formula, d the data computed from these nomograms for Manhattan, Kans.; data for Kansas stations, mpiled from Cockrines equation, DECKER's Columbia, Mo., investigations, the 3 German ethods of ALBRECHT, HAUDE and KALWEIT; and 3 Russian (Leningrad) methods for coeffi- ent of turbulent diffusion (by IVANOV, SKVORTSOV, and POLIAKOV) are reviewed extensively th illustrative data and development of the equations by the various authors. *Subject eadings:* **1. Evapotranspiration nomograms 2. Evaporation research 3. Evaporation bliographies 4. Manhattan, Kans.**—*M.R.*

10.2–22 551.576.2:522(791)

*McDonald, James E., **Cloudiness over the Southwestern United States and its relation astronomical observing.** *Arizona Univ. Institute of Atmospheric Physics, Scientific Report*, o. 7, Feb. 24, **1958.** 68 p. 14 figs., 12 tables, 13 refs. **DWB**—The cloudiness, sunshine d precip. data for all stations in Arizona, and for first order Weather Bureau Stations in the tire S.W. part of the U. S. are analyzed statistically in numerous ways and presented in bles and on maps to show the relative favorability of climate for night (and day) astronomical serving. Around Yuma the conditions are far better than in S.E. or in northern Arizona, t haze layers extending to 8,000 to 10,000 ft make the area less favorable than might be nstrued from the cloudiness data. Few peaks extend above the haze layer. In S.E. Arizona e high frequency of convective clouds around peaks during the summer monsoon (July and g.) detracts from the otherwise favorable situation. Data in graphic form show marked set of this monsoon. *Subject Headings:* **1. Cloudiness in Arizona 2. Astronomical observing Arizona monsoon 4. Arizona 5. Southwest United States.**—*M.R.*

10.2–23 551.524.3(433)

*Menzl, Oswald, **Die Temperaturverhältnisse von Eichstätt/Bayern.** [Temperature riations at Eichstätt, Bavaria.] Eichstätt, Bavaria, Verlag der Eichstätter Studien,

1955. 78 p. figs., 36+18 tables.—An attractive book giving a detailed climatological analysi of the temperature records for 1881–1950 at Eichstätt in the Altmühl Valley of the Jura i Bavaria (lat. 48°52.3 N, long. 11°11.1 E). History, location, equipment and records ar described and illustrated. The daily, 5-day, monthly and annual means and frequencies o maximum, minimum and mean temperature, number of freezing, frosty, summer and tropica days in each 5-yr period (1926–54), duration of high and low, rising and falling temps. prob ability of heat or coldwaves of 1–6 days duration, frequency and correlation of "waves" o temp. rise and fall, monthly and annual anomalies, 07, 14, and 21 h temp., mean maximum minimum, and daily range, absolute maximum, minimum and range and actual number o days each month of each year above or below certain temp. limits. Also, 2 large graphs sho annual course of mean and extreme temp. with "singularities" indicated (1926–52). Differen 5, 10, 20, 25 and 50 yr periods are compared. *Subject Headings:* **1. Temperature of Eichstätt Bavaria 2. Eichstätt, Bavaria.**—*M.R.*

10.2–24 551.586:628.8(02) 551.521.1:628.8(543

*Groundwater, Ivor S., **Solar radiation in air conditioning.** London, Crosby Lockwood **1957.** 125 p. 34 figs., 22 tables, refs. **DWB** (M86:628.8 G882s)—A practical book for th air conditioning engineer, architect or consulting engineer, with chapters covering: 1) th solar constant, atmospheric depletion and spectral variation in solar energy; 2) direct sola radiation and its variation with height, latitude, cloudiness, rainfall and orientation; 3) ir direct diffuse or sky radiation and its geographical height, weather and seasonal variations and urban effects; 4) amount of direct and solar radiation absorbed or reflected by buildin materials of various types; 5) methods of reducing sun loads (shades, insulation, sprinkling louvres); 6) methods of calculating the sun load; 7) specifications of the plant for air cond tioning; 8) the MACKAY and WRIGHT method; 9) the latent load and 10) comments on me teorological data, etc. Appended are 7 tables of meteorological data (av. monthly dry bul temperatures for each hour of the day, time of maximum dry bulb each month, highest averag hourly wet bulb temperature, average monthly maximum wet bulb temperature) at Calcutta total insolation and maximum intensity of global radiation at Poona. Also detailed table of hourly radiation on various walls on May 21st, building fabric heat gains and require refrigerating effects for month of May for Calcutta and Poona for various walls and window floor and roof using different methods. Tables and nomograms appear on almost every pag for use in making calculations, and examples of such calculations are interspersed throughou the book. *Subject Headings:* **1. Solar radiation-air conditioning manuals 2. Air conditionin 3. Calcutta, India.**—*M.R.*

10.2–25 551.46:532.5

†Longuet-Higgins, M. S., **Statistical analysis of a random, moving surface.** *Royal Societ of London, Philosophical Transactions, Ser. A*, 249(966):321–387, Feb. 21, **1957.** 14 figs 38 refs., numerous eqs. **DLC** —A theoretical treatise on the statistical properties of waves i the open ocean (or anywhere). The article is divided into 3 major parts: I. Description of th surface; II. Statistical properties; III. A method of determining the energy spectrum and i relation to observable statistical properties. The results are applicable not only to ocea wave surfaces but to microseisms or perturbations of the ionosphere. In Pt. I the long crested ness, the skewness, the carrier wave and the envelope are defined for describing the surfac of simple and complex wave patterns, degenerating and narrow spectra; Pt. II gives derivatio of expressions for statistical distribution of surface elevation and the magnitude and directio of the surface slope and in Pt. III the converse; given the statistical properties to find i energy spectrum. *Subject Headings:* **1. Ocean wave spectra 2. Statistical properties of wav spectra 3. Energy spectrum of waves.**—*M.R.*

10.2–26 551.515.2:551.501.8

Senn, H. V.; Hiser, H. W. and Low, E. F., **Studies of hurricane spiral bands as observe on radar, March 1–Sept. 30, 1956.** Miami, Univ. of (Coral Gables, Fla.). Marine Laborato and Radar Research Laboratory, Contract Cwb-8735, Final Report, Oct. **1956.** 49 p. figs. (incl. photos), 9 refs. **DWB**—In a major study of the characteristics of spiral bands precipitation, 443 time lapse radar photographs of bands in 5 hurricanes were analyzed. Th

equipment and computation methods are outlined; the frequency of crossing angles of bands are analyzed statistically; characteristics of the individual storms described and illustrated ("Easy," 1948; "Edna," 1954; "Connie," "Diane" and "Ione," 1955); relation to storm center, band widths and heights, correlation of bands with storm parameters, bands within bands, etc. discussed. The bands are mathematically described by the logarithmic spiral $\ln r = A + B\theta$, where r is the radius from the storm center to a point on the band, θ the angle between the radius and an assumed axis of origin, and A and B constants. Surf winds were found to cross the isobars at angles of 40°–50°, and bands at 20°–25°. (For Final Report, 1957, *see* 8.10–21, Oct. 1957, *MAB.*) *Subject Headings:* **1. Hurricane spiral bands 2. Radar photographs of spiral bands 3. Hurricane "Easy" (1948) 4. Hurricane "Edna" (1954) 5. Hurricanes, 1955.** —*M.R.*

10.2–27 551.521.1:620.91:016

*†United Nations. Dept. of Economic and Social Affairs, **New sources of energy and economic development: solar energy, wind energy, tidal energy, geothermic energy and thermal energy of the seas.** *United Nations, Publication*, E/2997 ST/ECA/47, May **1957.** 150 p. 11 figs., 12 tables, annotated bibliog. p. 119–151 (475 refs.). **DWB** (118 U585ne), **DLC** (JX1977.A2)—A sizeable monograph covering the present state of knowledge and possibilities for future development in the five fields of energy utilization which have not yet been thoroughly exploited. An annotated bibliography of 480 items is presented under 6 major headings: 1) General—15 items; 2) Solar energy—242 items; 3) Wind energy—148 items; 4) Tidal energy—47 items; 5) Geothermal energy—18 items and 6) Thermal energy of the seas—10 items. The text covers the physics, economics, uses, limitations and forseeable developments in technology under each heading. Various forms of equipment and surveys in each country of potential resources and present and future developments are included in each section. *Subject Headings:* **1. Solar energy 2. Wind energy 3. Bibliography on natural sources of energy.**—*M.R.*

10.2–28 551.578.7:551.574.1

*†Ludlam, F. H. (*Imperial College, London*), **The hail problem.** *Nubila*, Verona, Italy, 1(1):12–96, **1958.** 12 figs., 18 tables, 55 refs., 72 eqs. **DWB**—This major monographic paper summarizes recent advances in most of the aspects of the hail problem; necessity for cumulus convection, theory of thermals, actual thermals, internal structure of cumulus, aerosol particles, formation of cumulus cloud particles, size spectrum of drops in Cu, formation of fall out in Cu, growth of hailstones (dry and wet), density of hailstones in different stages, use of growth equations, melting of large hailstones, maximum size of hailstones, forecasting the maximum size of hailstones, evaluation of the storm cloud and prevention of hailstorms. Many graphs and diagrams representing both theoretical and empirical models are included, and sources are well documented. It is considered that hailstorms may be suppressed by heavy seeding with AgI or with hygroscopic salts. *Subject Headings:* **1. Hail physics 2. Cloud physics 3. Hail suppression.**—*M.R.*

10.2–29 551.524.7:551.510.52/3(584)

*Kravtsova, L. M., **Temperaturnyĭ rezhim svobodnoĭ atmosfery nad USSR.** [Temperature regime of the free atmosphere over Ukranian SSR.] *Leningrad. Nauchno-issledovatel'skiĭ Institut Aeroklimatologii, Trudy*, No. 3:3–56, **1957.** 23 figs., 20 tables. **DWB**—Radiosonde data (to 16 km) for the entire period 1947–49 and in part for 1950–52, for 6 stations in the Ukraine and three in bordering regions, are the basis of an extended analysis of upper air temperatures, with special discussions of inversions and the structure of the tropopause. Data for all the stations are represented in the results, but the chief emphasis is on the radiosonde stations at Odessa and Kursk. Included are monthly mean upper air temperatures, mean vertical temperature gradients in specified layers of the atmosphere and frequencies of various classes of gradients, and maps of mean summer and winter isotherms. A special section on inversions contains monthly inversion frequencies, mean thicknesses, and mean and maximum temperature spreads, as well as data on humidity variations through inversions. Also provided are frequencies of heights and temperatures of the tropopause, the latter distinguished according to several types. The final pages contain a detailed analysis of relation-

ships between the tropopause and various characteristics of the lower troposphere, with synoptic illustrations. *Subject Headings:* **1. Upper air climatology of the Ukraine 2. Tropopause statistics 3. Inversions in the Ukraine 4. Ukraine, U.S.S.R.**—*R. S. Quiroz.*

ATLASES AND MANUALS

See also: **Weather broadcast schedules, Europe, Greenland and N. Atlantic,** 10.2–53.

10.2–30 551.509.317

*Bryson, Reid A.; Lahey, James F.; Somervell, Willis L., Jr. and Wahl, Eberhard W., **Normal 500 mb charts for the Northern Hemisphere: annual, seasonal, and monthly with monthly standard deviations and data lists.** Wisconsin. Univ. Dept. of Meteorology, Contract AF 19(604)-992, Scientific Report, No. 8, Nov. **1957.** 2 p. 34×38 cm. 29 charts, 8 tables. **DWB**—These charts were prepared by direct punching of 500 mb heights from carefully analyzed charts for Oct. 1945–Jan. 1953 for 10° longitude at even 10° latitude intersections from 10° to 70°N and at longitude ending in 5° for 15°–65° latitude intersections. Data were checked by computing geostrophic winds to eliminate absurd values. Standard deviations from mean monthly 500 mb values were computed for all grid points. Separate charts are presented for mean of all data, mean winter, spring, summer and autumn and mean and standard deviation for each separate month—Jan.–Dec. (29 charts in all). Charts are on transparent paper. *Subject Headings:* **1. Northern Hemisphere 500 mb charts 2. Mean 500 mb charts.**—*M.R.*

10.2–31 551.5(02)

Vitkevich, Vitol'd Ignat'evich, **Praktisheskie zaniatiia po meteorologii.** [Practical exercises in meteorology.] Moscow, Gos. Izd-vo Sel'khoz. Lit-ry, **1957.** 205 p. 76 figs., forms, eqs. **DLC** (QC869.V5)—A textbook or laboratory manual for technical school students of meteorology or agricultural meteorology (7000 copies) consisting of 36 ch., comprising 36 separate "problems" or exercises on instrumental and observational aspects of the science. Exercises include: 1) determination of time of sunrise and sunset and twilight, 2) heliograph, 3) thermometric actinometer, 4) Michelson actinometer, 5) Ianishevskiĭ actinometer, 6) use of pyranometer to measure diffuse and total radiation, 7) Ianishevskiĭ albedometer, 8) pyrgeometer, 9) temp. measurement, 10) phytopsychrometer, . . ., 17) dew point measurement, 22) soil temp., 23) evaporation, 25–26) snow measurement, 32) barograph, 33) clouds, 34) local forecasting from signs, 36) observations at meteorological stations (including forms). Most of the equipment is illustrated and its use and correction indicated. *Subject Headings:* **1. Meteorology laboratory manuals 2. Agrometeorological instruments 3. Instrument textbooks.** —*M.R.*

10.2–32 551.501.1(02)

U. S. Weather Bureau, **Training aid for synoptic observations.** Its *Training Paper*, No. 12, Aug. **1955.** 13 p. **DWB** (MO1.1 U587tr)—Brief notes for weather observers at second order synoptic stations. Various elements such as sky cover, ceiling height, visibility, past weather, precip., etc. are treated with references to sections of its *Training Paper*, No. 9, **Circular N, Circular S,** and **1955 synoptic code** where the element is discussed. A lengthy set (50) of multiple choice questions, and references to authorities for finding answers, is appended. *Subject Heading:* **1. Observers training manuals.**—*M.R.*

POPULAR METEOROLOGY BOOKS

See also: **Australian Antarctic Research Expeditions** (Law, Bechervaise), 10.2–45; **Antarctic expeditions, Mirny, Antarctica** (Khvat), 10.2–46; **British participation in IGY,** 10.2–50.

10.2–33 551.5(02):087.5

Gallant, Roy A., **Exploring the weather.** Illus. by Lowell Hess. Garden City, N. Y., Garden City Books, **1957.** 64 p. Illus. (many in color). **DLC** (QC863.G28)—Popular or

juvenile treatment of the basic principles of weather, the atmosphere, general and local circulations, water vapor, fog and clouds; rain, hail, sleet and snow, hurricanes, tornadoes and thunderstorms; air masses and fronts, weather maps and forecasting and artificial rain making and satellites. The book is profusely illustrated with large colored schematic drawings explaining theories or facts about the atmosphere and its structure, motions and phenomena. *Subject Headings:* **1. Juvenile meteorology textbooks 2. Popular meteorology books.**—*M.R.*

10.2–34 551.46

Doukan, Gilbert, **The world beneath the waves.** Trans. by A. and R. M. Case. N. Y., John de Graff, **1957.** 356 p. 32 figs., foot-refs. Trans. of his **Les decouvertes sous-marines modernes. DLC** (GC69.D613)—A popular book on submarine exploration, underwater hunting, equipment and conditions of life; submarine archaeology, photography, moving picture and television; marine biology and submarine research and knowledge obtained by these methods. Photographs have been taken at depths of 13,000 ft in both the Atlantic and Pacific. The benthograph, a sphere with portholes, rests on the bottom and can take color pictures on 20 mm film at 30 sec. intervals and can photograph seascapes up to 50 ft distance. Life has been proven at 16,000 ft depth. Artificial lighting is discussed in detail. Underwater movies have been made since 1913. Much attention is given to hazards and habits of marine fauna. *Subject Headings:* **1. Submarine exploration 2. Submarine photography.**—*M.R.*

TRANSLATIONS

See: **Russian literature on satellites, 10.2–76.**

GENERAL GEOPHYSICS AND METEOROLOGY

ARCTIC RESEARCH

10.2–35 551.581(98) 91(98)

Hare, F. Kenneth (*McGill Univ.*), **Arctic geography and climate.** (In: Polar Atmosphere Symposium, Oslo, July 2–8, 1956, **Proceedings, Pt. 1, Meteorology Section.** N. Y., Pergamon Press, **1958.** p. 3–8. fig., 8 refs.) **DWB.** Also in: *Journal of Atmospheric and Terrestrial Physics*, London, Special Supplement, Pt. 1, 1957. pub. **1958.** p. 3–8. fig., 8 refs. **DLC**—The Arctic and sub-Arctic cannot readily be defined in terms of atmospheric circulation. Instead one must depend on certain geographical distributions in partial equilibrium with the existing climates. These include (1) the zonation of natural vegetation, (2) the occurrence of permafrost and patterned ground, (3) the distribution of sea, lake and river ice, (4) the continental glaciers, and (5) the circulation of Arctic and sub-Arctic water masses. The mechanism of climate control over these distributions can be revealed only by physical meteorological research at present rarely undertaken. A map is presented showing the basic distributions as at present known. *Subject Headings:* **1. Arctic climates 2. Arctic geography.**—*Author's abstract.*

10.2–36 551.521.12(268)

Fritz, Sigmund (*U. S. W. B., Wash., D. C.*), **Solar radiation measurements in the Arctic Ocean.** (In: Polar Atmosphere Symposium, Oslo, July 2–8, 1956, **Proceedings, Pt. 1, Meteorology Section.** N. Y., Pergamon Press, **1958.** p. 159–166. 7 figs., 6 refs.) **DWB.** Also in: *Journal of Atmospheric and Terrestrial Physics*, London, Special Supplement, Pt. 1, 1957. pub. **1958.** p. 159–166. 7 figs., 6 refs. **DLC**—Measurements of solar radiation from the sun and sky on a horizontal surface have been made on the ice island, T-3, by the U. S. Air Force Cambridge Research Center. The results for the year 1953 are summarized and compared with similar measurements in the Antarctic and in middle latitudes. For overcast days in midsummer the amount of energy received is similar to that received in the Antarctic. When the data are compared to those for Washington, D. C., the fraction of the extra-terrestrial energy which is transmitted to the ground is greater in the Arctic. This may be explained by the higher surface albedo in the Arctic, but differences in cloud properties may also contribute to the explanation. The relation between the measured solar energy and the amount of ice

melted is briefly discussed. *Subject Headings:* **1. Solar radiation measurements 2. Arctic Ice Island (T-3) 3. Arctic Ocean.**—*Author's abstract.*

10.2–37 551.515.7:551.509.3(98)

Fjørtoft, Ragnar (*Det Norske Met. Inst., Norway*), **The problem of the maintenance of the low-level anticyclonic circulation in the Arctic.** (In: Polar Atmosphere Symposium, Oslo, July 2–8, 1956, **Proceedings, Pt. 1, Meteorology Section.** N. Y., Pergamon Press, **1958.** p. 87–92. 4 figs., 4 eqs.) **DWB.** Also in: *Journal of Atmospheric and Terrestrial Physics*, London, Special Supplement, Pt. 1, 1957. pub. **1958.** p. 87–92. 4 figs., 4 eqs. **DLC**—The normal pressure maps for November are examined in light of the equations determining the distribution of vertical motions and the corresponding fields of horizontal divergence. The investigation suggests that the Arctic anticyclonic circulation in low levels is maintained essentially in the way that the flow patterns and mass distributions frequently existing in the atmosphere, and also found in the normal maps, cause a tendency for the air masses to be deflected in such a way to give a net warming by advection in the surroundings of the region where the Arctic anticyclone is found, thus causing the air in the middle to descend and spread at the ground. *Subject Headings:* **1. Arctic anticyclonic circulation 2. Synoptic studies 3. Arctic.**—*Author's abstract.*

10.2–38 551.513:551.524:551.581(98)

Flohn, H. and Seidel, G., **Recent studies on the Arctic troposphere and its teleconnections.** (In: Polar Atmosphere Symposium, Oslo, July 2–8, 1956, **Proceedings, Pt. 1, Meteorology Section.** N. Y., Pergamon Press, **1958.** p. 62–70. 8 figs., 6 tables, 7 refs.) **DWB.** Also in: *Journal of Atmospheric and Terrestrial Physics*, London, Special Supplement, Pt. 1, 1957. pub. **1958.** p. 62–70. 8 figs., 6 tables, 7 refs. **DLC**—The investigations are based on the evaluation of the daily mean tropospheric temperature, represented by the thickness 500–1000 mb, over the Central Arctic (75–90°N) during each winter from 1949–50 to 1955–56 and of daily values of the area covered by Arctic air (defined through a thickness of less than 5000 geopot. m) as a whole and divided into four sections of the Northern Hemisphere. These data are compared with circulation indices of middle latitudes and particularly over Europe, since hemispherical indices are only of restricted value for regional forecasting. There was no evidence for regular and persistent periodicities in the Central Arctic. The average patterns of the general circulation in sub-Arctic and Arctic regions are discussed. The average tropospheric temperature of the Central Arctic between November and March shows strong irregular time variations. Direct relationship between the hemispheric zonal index and the mean temperature of the Arctic, as suggested by F. DEFANT, could not be verified. The area of Arctic air over the N. American sector is rather closely connected with the temperature of the Central Arctic; an increase (outbreak) of Arctic air in that section shortly precedes general warming of the Central Arctic. Starting from the example of the cold period of Feb. 1956, in Central Europe, a connection between the area of Arctic air over the Siberian section and the average zonal wind component at the 500 mb level over Europe (with a delay of about one week) could be found in several winters. Large scale anomalies of the middle latitude circulation, especially the blocking of the westerlies, appear to be connected with asymmetric shifting of the Arctic cold air to one side of the polar region. Additional statistical studies on the aerology of the cold air center in eastern Siberia confirm earlier results. The low variability of temperature above the inversion is discussed. *Subject Headings:* **1. Arctic temperature data 2. Arctic influences on general circulation 3. Aerological data for Arctic 4. Arctic.**—*Authors' abstract.*

10.2–39 551.581(98/99)

Holcombe, Richard M. (*U. S. Navy Hydrographic Office, Suitland, Md.*), **Similarities and contrasts between the Arctic and Antarctic marine climates.** (In: Polar Atmosphere Symposium, Oslo, July 2–8, 1956, **Proceedings, Pt. 1, Meteorology Section.** N. Y., Pergamon Press, **1958.** p. 9–17. 10 figs., 12 refs.) **DWB.** Also in: *Journal of Atmospheric and Terrestrial Physics*, London, Special Supplement, Pt. 1, 1957. pub. **1958.** p. 9–17. 10 figs., 12 refs. **DLC**—With the increase in the number of scientific and exploratory expeditions to polar regions during this century, new information has given scientists an opportunity for re-examination of many of the effects of the air circulation both at the surface and aloft. Continental and mari-

ime influences are partially responsible for many climatic differences between the Antarctic nd Arctic. In the last few years the U. S. Navy Hydrographic Office has been able to delineate ome of these northern and southern hemispheric comparisons with information gathered from nany countries. With the increase in available punchcard data many presentations such as requency distributions of various weather elements have been made possible during the past 5 yrs. By assuming a model consisting of a polar stereographic map projection of the Arctic nd a mirror image of a polar stereographic map projection of the South Pole for the Antarctic, nd by using similar scales for both projections, a visual comparison of climatological conditions or both hemispheres is facilitated. This model has the convenience of counterclockwise irculation about lows, and clockwise circulation about highs in both hemispheres. Also, tatistical comparisons of basic meteorological parameters, including their deviations, are eadily obtained from this model. The Hydrographic Office also has managed to obtain ummaries of raobs and rawins in the Arctic and Antarctic regions. The combined results of HJUMP and the Byrd Expeditions indicate close agreement, in respect to general circulation, ith the findings of ARNOLD COURT and some of the ideas postulated after the Scott Expedition. he extremely broad ranges of height and temperatures for standard levels above the tropo- ause at Alert, N.W.T., do present some questions. *Subject Headings:* **1. Arctic-Antarctic limate comparisons 2. Polar circulation 3. Polar climates.**—*Author's abstract.*

10.2–40 551.506.5(988):551.589.1

§Hamilton, R. A. (*Met. Office, Prestwick*), **The meteorology of North Greenland during the id-summer period.** *Royal Meteorological Society, Quarterly Journal,* 84(360):142–158, pril **1958.** 22 figs., 7 tables, 6 refs. **DWB, DLC**—An elevated ice sheet of the size of Green- nd has a strong influence on its own weather. On account of the cooling by radiation of the ow surface and of the lower layers of the air there is a tendency for a system of low-level utflowing katabatic winds to be set up. The weather is also influenced by the cyclonic ystems characteristic of middle latitudes and their associated fronts. Northern Greenland far from the main track of Atlantic depressions, and as the inland ice is here at its widest, onditions appear suitable for the establishment of the glacial anticyclone which would be xpected to be disturbed only rarely by cyclonic systems. In order to study the frequency of ese disturbances, and the normal meteorological conditions in the undisturbed periods, an nvestigation has been made of the weather in the area during the six midsummer weeks of 953, in particular of the observations made at "Northice" near the crest of the ridge of the land ice and at Britannia Sø near the east coast. Owing to the elevation of the ice sheet ean sea-level synoptic charts cannot be used satisfactorily, and a method of drawing 700 mb harts and using the same techniques as are used in temperate regions for analysis of mean ea-level charts has been developed. As the weather is predominantly fine all occurrences of ppreciable cloudiness, precipitation and abnormal surface wind are significant and in almost l cases were due to cyclonic disturbances and their associated fronts which could be followed n the series of 700 mb charts. A total of 16 depressions or waves caused 19 disturbances n three cases the effects of the warm and cold fronts were clearly separated) at either one or oth of the two stations, but only 5 of these caused precipitation exceeding 1.0 mm at either ation. During the anticyclonic period of 11 days when the 700 mb wind was light and ariable the weather at Northice was fine with a katabatic surface wind of 280° 13 kt. The urnal range of temperature at Northice was 6.8°C but only 3.7°C at Britannia Sø. The urnal variation of relative humidity was small. The upper winds at Northice were mainly to W at low levels and S to E at 16 km. A comparison of June 1953 with June 1954, and ith statistics for other Greenland stations in other years, indicates that the midsummer of 953 can probably be regarded as representative of a normal midsummer. *Subject Headings:* **Synoptic climatology 2. Cyclonic disturbances 3. Climate of Northice 4. Greenland.** —*Author's abstract.*

10.2–41 551.501.9(988) 551.593(988)

U. S. Corps of Engineers, **Greenland Research and Development Program: 1957 after erations report.** Nov. 1, **1957.** 10 p. 3 figs. **DWB** (919.8 U563af)—Among the main 957 projects listed and described are "Project 1.3," Meteorological Stations, Project Leader t Lt. R. C. DE WILDE; "Project 23.1"—Whiteout Studies, Project leader Mr. H. E. REIQUAM

of SIPRE and several snow study projects. The U. S. Army Engineer Arctic Task Force moved from Fort Belvoir, Va. to northern Greenland during March 14–April 29, 1957 and the research and development projects were in active field work from April 15–Sept. 9, 1957 at or near Thule. Three meteorological stations were established and operated to determine temp. at various levels above and below ground and solar radiation. *Subject Headings:* **1. Arctic research projects 2. Polar whiteout studies 3. Thule, Greenland. I. Clark Elmer F.**—*M.R.*

10.2–42 551.577.34(988

Diamond, Marvin (*Snow, Ice and Permafrost Res. Estab., Corps of Eng., U. S. Army Wilmette, Ill.*), **Precipitation trends in Greenland during the past thirty years.** *Journal of Glaciology*, London, 3(23):177–180, March **1958.** 5 figs., 6 refs. English and German summaries p. 177. **DWB, DLC**—The record of annual precipitation as obtained from stratigraphic studies on snow profiles in the interior of northern Greenland made in 1954 by SIPRE personnel shows a decreasing precipitation trend since 1920 with the largest decrease occurring since 1932. A residual mass curve analysis of the data indicates that, in spite of large fluctuations in the accumulated precipitation, the decreasing trend may be considered valid over a period of several years. *Subject Headings:* **1. Precipitation trends 2. Greenland.**—*Author's abstract.*

10.2–43 551.506.5:551.311.12(491.1

Hannell, F. G. and Ashwell, I. Y. (*both, Univ. of Bristol*), **Meteorological studies in Iceland** *Weather*, London, 12(12):365–372, Dec. **1957.** 5 figs., 5 refs. **DWB, DLC**—An account of the 6 weeks of work on or near Langjökull, in central Iceland (lat. 64°28′N, long. 20°15′W) by the British Schools Exploring Society's 18th Expedition, during Aug. and Sept. 1956. The purpose was to obtain regular synoptic reports of mean weather elements from Aug. 7–Sept. 1 and transmit them to the Weather Bureau at Reykjavik, to make hourly observations of temp., humidity and wind at 3 altitudes on the glacier, and to study frequency duration and strength of katabatic winds, to make daily ablation measurements at ½ mi intervals up the S slope of Langjökull, to make snow pit observations, cloud conditions over the ice cap (convective and lee-wave clouds), etc. The main meteorological station was at S.E. edge of the glacier, on stony ground 335 m above sea level. *Subject Headings:* **1. Glacier-meteorological expeditions 2. Langjökull Glacier, Iceland.**—*M.R.*

10.2–44 551.583.3:551.311.18

Ewing, Maurice (*Columbia Univ.*) and Donn, William L. (*Brooklyn College*), **A theory of Ice Ages, Pt. 2.** *Science*, Wash., D. C., 127(3307):1159–1162, May 16, **1958.** 18 refs. **DLC**—Greenland and Antarctic glaciation is believed to have been much the same during the Pleistocene glaciation as today, but great differences existed in Canada and in the high mountains of Africa, S. America and Australia or New Zealand, owing to (1) greater moisture supply from open Arctic sea, and (2) cooler temps. on account of lowered insolation (higher albedo of glaciated areas and of pluvial regions where deserts now exist). The difference in energy received on account of this higher albedo is calculated as 6×10^{19} cal/day out of 470 cal/cm²/day —an appreciable reduction. Changes in circulation patterns resulting from glaciated continents are enumerated in an attempt to explain the pluvial conditions of the mid and low latitudes. (For Pt. 1, *see* 7.11–274, Nov. 1956, *MAB.*) *Subject Headings:* **1. Glacial period theories 2. Arctic ice formation 3. Pleistocene glaciation 4. General circulation during Pleistocene glaciation.**—*M.R.*

ANTARCTIC RESEARCH

See also: **Arctic-Antarctic climate comparisons** (Holcombe), 10.2–39.

10.2–45 550.3:551.506.5(99

Law, Phillip (*Dir., Antarctic Div., Dept. of External Affairs, Australia*) and Bechervaise John (*Officer-in-charge, Heard Island*, 1953, *Mawson*, 1955), **ANARE, Australia's Antarctic outposts.** Melbourne, Oxford University Press, **1957.** 152 p. Numerous photos (many i

lor). **ANARE personnel, 1956–1957 (by Expeditions).** p. 136–147. **DWB** (999 L416an)—n elegant volume with many fine colored illustrations (some large size full page) depicting id describing the activities in Antarctic research, especially of the Australians, before IGY. iips, icefloes, icebergs, mountains, landing, air reconnaissance, sledding, coastlines, bird and a life, clouds, blizzards, aerological observations, auroras, ice sheet, plateau camp, activity i Macquarie Island (cosmic ray laboratory, rotor clouds, etc.), and history of exploration e covered with brief text and many photos. *Subject Headings:* **1. Australian Antarctic esearch Expeditions 2. Antarctic IGY preparations.**—*M.R.*

10.2–46 91.04(99) 551.506.22

Khvat, Lev Borisovich, **Zagadochnyĭ materik.** [Enigmatic continent.] Moscow, osud. Izdat-vo Geograficheskoĭ Literatury, **1956.** 287 p. figs. **DWB** (919.9 K45za)—A opular account (50,000 copies) of the discovery and exploration of the Antarctic, the scientific peditions of Scott, Byrd, etc., the Soviet whaling expeditions, Operation Highjump and eepfreeze after World War II, the IGY proposal and, finally, the Soviet expedition to es-blish Mirny and the experiences at Mirny, and the scientific discoveries of the IGY, both on e continent (glaciological, geological, climatic) and at sea in the Southern Ocean. The mate and weather results are described on p. 269–272. *Subject Headings:* **1. Antarctic peditions 2. Soviet Antarctic research 3. Mirny, Antarctica.**—*M.R.*

10.2–47 551.578.41(99)

Swithinbank, C. W. M., **Dr. E. A. Wilson's records of a pit section dug in the Ross Ice helf in 1903.** *Journal of Glaciology*, London, 3(23):176, March **1958.** photo. **DWB, DLC**—photograph of a hand-written record by E. A. Wilson, made on Nov. 21, 1903, on the Scott xpedition at Fair Weather Bay, 168°E on the Antarctic coast. The record is believed to be the st record of a snow structure study in Antarctica. The pit record showed that in 1902 there as 23″ of snow (61 cm) deposited. The record goes from the surface to 5′ depth. *Subject eadings:* **1. Snow structure records 2. Snow pit studies, Antarctica 3. British Antarctic xpedition (Terra Nova), 1910–1913 4. Fair Weather Bay, Antarctica.**—*M.R.*

10.2–48 551.5:551.46:629.13:627.95(99)

*U. S. Hydrographic Office, **Meteorological and oceanographic factors relating to Antarctic r-sea rescue operations and human survival.** Its *H. O. Publication*, No. 16,659, Aug. **1957.** p. mostly figs. (57 charts, fold.). **DWB** (M:629.138613 U583me)—Meteorological and eanographic data and information needed to evaluate survival and air-sea rescue factors in e area from New Zealand to McMurdo Sound, Antarctica (40° to 80°S and 160°–180°E) e compiled and presented in graphic form with a 10 page commentary on surface winds, les and winds aloft; clouds, visibility; sea and swell, ocean circulation (west and east wind ift), ice conditions, sea surface temperatures; wind chill and immersion hypothermin (heat ss in cold water). Large folded monthly charts of wind frequencies (Oct.–April), winds oft frequencies at 1000, 5000 and 10,000 ft, frequencies of total and low cloud coverage, equencies of visibility <5 mi and $<\frac{1}{2}$ mi, sea surface temp. and human survival times, etc. e included. *Subject Headings:* **1. Meteorology of New Zealand-McMurdo Sound air route Oceanography of New Zealand-McMurdo Sound air route 3. Air-sea rescue operations Human survival in Antarctic waters 5. Antarctic seas 6. New Zealand-McMurdo Sound rway.**—*M.R.*

10.2–49 551.594.5:551.501:551.506.22(99)

Gartlein, C. W. (*Cornell Univ.*), **Visual observation of the aurora in the Antarctic.** (In: icago Univ., Yerkes Observatory, Williams Bay, Wisc., Contract AF 19(122)-480, Technical eport, No. 22, **Symposium on auroral observations during the IGY,** Sept. 17–26, 1956, pub. **56.** p. 3–6.) **DWB**—Notes and specific instructions on coding and reporting auroras in e Antarctic at 15 min (or 1 hr) intervals during displays and directions of the geomagnetic le from 6 stations in Antarctica. Equipment consists of an alidade, diagram card and rk sense report card. *Subject Headings:* **1. Auroral observation in Antarctica 2. IGY roral observation instructions 3. Visual auroral observation.**—*M.R.*

IGY

See also: **Auroral observation, Antarctica** (Gartlein), 10.2–49; **Radioactivity in sea water, North Pacific Ocean** (Miyake), 10.2–68; **Project Vanguard** (Strong), 10.2–74.

10.2–50 550.3:551.506.2

International Geophysical Year, 1957/1958. British National Committee, **Guide t IGY International Geophysical Year, 1957–8.** Foreword by Sir James Wordie and con tributions by W. J. G. Beynon, G. E. R. Deacon, etc., London, Methuen, **1958.** 48 p. photos figs. Price: 2 sh. 6 d. **DWB** (551.I61gu). Review in *Science Progress*, London, 46(181):180 Jan. **1958. DLC**—A neat pamphlet intended to inform the public about the IGY program o 1957–58, and especially the British part. Articles by fourteen prominent British scientist are included: Meteorology (SUTTON), Glaciology (MANLEY), Oceanography (DEACON) Seismology (STONELEY), Rockets (MASSEY), Ionosphere (BEYNON), Cosmic rays (T. GOLD) Geomagnetism (STAGG), Aurora and Airglow (PATON), Solar activity (ELLISON), and a rathe detailed article by MASSEY, H. S. W., on the **Skylark high altitude research rocket** and on on the **U. S. satellite programme,** etc. Many fine photos, charts and graphs illustrate activitie and results of observations. *Subject Headings:* **1. IGY program 2. British participation in IGY 3. Skylark High Altitude Research Rocket. I. Wordie, Sir James II. Massey, H. S. W** —*M.R.*

10.2–51 550.3:551.506.2

Michelson, Börge (*Danish Association of Science Writers*), **IGY in Denmark.** *Science* Wash., D. C., 124(3218):408–409, Aug. 31, **1956. DLC**—Plan for publicizing IGY in Den mark with a view toward interesting high school students in science. *Subject Headings* **1. International Geophysical Year, 1957–1958 2. Education.**—*M.R.*

10.2–52 550.3:551.506.2

Deacon, G. E. R., **International Geophysical Year 1957 to 1958.** [*Great Britain*]. *Roya Naval Scientific Service, Journal*, March **1956.** Reprint of 3 p. Also issued as *Nationa Institute of Oceanography, Wormley, Collected Reprints*, 4(149), **1956. DWB**—The program o the IGY is discussed with special reference to the ionospheric and geomagnetic research and th oceanographic programs including marine physics, short-period and long-period changes in sea level, variations in world glaciers, oceanographic, meteorologic and geographic studies in th South polar regions, oceanographic studies of the Southern Ocean, including subsurfac current measurements, wind drag, etc. *Subject Headings:* **1. British participation in IG 2. IGY program.**—*I.L.D.*

WMO

See also: **Jet stream characteristics** (Berggren et al.), 10.2–17.

10.2–53 551.5:061.

World Meteorological Organization, **Weather Reports, Vol. D, Pt. A, Meteorologica Broadcast Schedules, Region VI, Europe.** Its *WMO (Publication)*, No. 9, TP. 4, **1955** edition Each country paged separately. Loose-leaf. charts. On cover: **Weather reports, stations codes and transmissions, Vol. D, Information for shipping. DWB** (MO6 W927p No. 9 Vol. D, Pt. 2)—Charts show weather forecast and storm warning areas for Denmark, France Iceland, Malta, Netherlands, Norway and Faroe Islands, Poland, Spain, Sweden and U.K including in each case broad coastal or oceanic areas surrounding or away from the give country. Schedules of broadcasts are given for 37 countries in Europe, in many cases separat sheets being included for different broadcasting points within the given country. *Subje Headings:* **1. Weather forecast areas 2. Weather broadcast schedules 3. Europe 4. Green land 5. North Atlantic.**—*M.R.*

10.2–54 551.5:061.

Technical Assistance Programme. *World Meteorological Organization, WMO Bulleti* 5(3):96–99, July **1956.** photos. Also: **Collaboration with other international organizatio** *Ibid.*, p. 99–101. Also: **Activities of the Technical Commissions.** *Ibid.*, p. 101–103. Also **Activities of Regional Associations.** *Ibid.*, p. 104. **DWB**—The WMO was represented a

the 35th meeting of the U.N. Technical Assistance Board (TAB) in Geneva in March 1956 by W. R. Dyer. Procedures to facilitate planning by WMO are suggested. The Eighth session of the Executive Committee also considered the 1957 program. Activities of several experts are noted and the death of A. Crespi in Buenos Aires (he had been in Nicaragua as Technical Advisor) regretted. *Subject Headings:* **1. WMO Technical Assistance Program. I. Crespi, A.**—*M.R.*

10.2–55 551.5.061.6

Technical assistance programme. *World Meteorological Organization, WMO Bulletin,* 5(4):141–144, Oct. **1956.** 2 photos. **DWB**—Account of 36th meeting of the Technical Assistance Board of U.N. in Geneva July 1956 and the WMO participation in its activities. The 37th meeting was held in N. Y. in Oct. 1956. WMO and Regional 1957 program, the plans for 1958 program, current program in Chile, Iceland, Middle East, etc., collaboration with FAO and evaluation of program held in Paris in Aug. 1956. All meetings were attended by W. R. Dyer. *Subject Headings:* **1. WMO Technical Assistance Program. I. Dyer, W. R.**—*M.R.*

10.2–56 551.5:061.6

Secretary-General's visit to North and South America. *World Meteorological Organization, WMO Bulletin,* 6(1):7–9, Jan. **1957.** photo. **DWB.** Also: **Technical Assistance Programme.** *Ibid.,* 6(2):65–68, April **1957.** photo. **DWB**—Brief notes on contacts made at the many places visited by the secretary general of WMO., D. A. Davies, during a 2 months trip in Sept.–Nov. 1956. He visited France, England, Scotland, Canada, the U. S., Cuba, Mexico, Venezuela, Peru, Argentina and Brazil. He attended an IATA meeting in Edinburgh, the U.N. in New York, and ICAO headquarters in Montreal. The second article contains notes on the expanded Technical Assistance Programme for 1957. A survey of member countries revealed demands at least 4 times as great as budget allows. Some of the programs or activities being carried out are mentioned. Iraq, Nicaragua, Brit. E. Africa (locust control), Iran, Afghanistan and India were involved. *Subject Headings:* **1. WMO Secretariat 2. Meteorological services 3. WMO Technical Assistance Program.**—*M.R.*

CONFERENCES AND SYMPOSIA

10.2–57 551.5:63:061.3(477)

Gavrilenko, N. M., **O koordinatsii nauchno-issledovatelskikh rabot.** [Coordination of scientific research work.] *Meteorologiia i Gidrologiia,* Leningrad, No. 5:67, May **1957. DWB**—Report of a meeting on research on agricultural hydrometeorology held during Sept. 1956 at the Ukrainian Scientific Hydrometeorological Institute, attended by representatives of ten scientific institutions of the Ukraine. There was noted an inadequate collaboration among institutes and universities so that considerable duplication resulted. A uniform method of investigations is lacking for the physiographic zones of the Ukraine; long range forecasting was insufficiently developed in the Ukraine. Various resolutions to remedy defects were passed. *Subject Headings:* **1. Agrometeorology conferences 2. Ukrainian S.S.R.**—*I.L.D.*

10.2–58 551.508:061.3

Nauchno-tekhnicheskaia konferentsiia priborostroiteleĭ. [Scientific-technical conference of instrument makers.] *Meteorologiia i Gidrologiia,* Leningrad, No. 8:73–74, **1957. DWB, DLC**—A summary of the proceedings of a conference on geophysical and hydrometeorological instrumentation held on 18–20 March 1957 by the Leningrad Society of the Scientific Instrument Industry, the Central Geophysical Observatory, etc. Papers were presented on the basic principles of constructing instruments for increasing nonelectrical magnitudes by electrical means, on new apparatus used by the Central Geophysical Observatory such as an automatic hygrometer, on the use of radioactive isotopes for studying the hydrologic cycle, etc. *Subject Headings:* **1. Instrument conferences 2. U.S.S.R.**—*I.L.D.*

10.2–59 551.5:63:061.3 551.586:615.8:061.3

Nauchnaia sessiia v selenii Khutsubani. [Scientific session at the village of Khutsuban.] *Meteorologiia i Gidrologiia,* Leningrad, No. 4:64, April **1957. DWB, DLC**—During the past few years, the Tiflis Scientific Hydrometeorological Institute has been holding annually

scientific sessions on various collective and state farms in Georgia (U.S.S.R.). This is a brief report of such a session held during Oct. 1956 on I.V. Stalin collective farm near the village of Khutsuban. Papers were read on the agricultural value of weather forecasts, agroclimatic conditions of the Kobulatskiĭ district, balneologic and resort value of the Adzhar coast, etc. *Subject Headings:* **1. Agrometeorological conferences 2. Balneological conferences 3. Khutsuban, Kobulety District, Georgian S.S.R.**—*I.L.D.*

10.2–60 551.46(08)

International Oceanographic Congress. *Science*, Wash., D. C., 127(3307):1163–1164, May 16, **1958. DLC**—International Oceanographic Congress to be held at U.N. in New York Aug. 30 to Sept. 12, 1959 under sponsorship of AAAS and UNESCO Special Committee on Oceanic Research of ICSU. Conference will be concerned with basic science rather than applications. Five symposia are outlined: 1) history and climate, 2) boundaries, 3) deep sea, 4) dynamics of organic and inorganic matter in sea and 5) marine biology. Three invited lectures will be given each morning, two days being devoted to each section. Papers will be in English, French, German, Russian or Spanish. *Subject Headings:* **1. International Oceanographic Congress, Sept. 1959, New York City 2. Oceanographic symposia.**—*M.R.*

SERVICES, INSTITUTIONS AND OBSERVATORIES

10.2–61 551.5:061.6

Makhover, Z. M., **Obsluzhivanie narodnokhoziaĭstvennykh organizatsiĭ gidrometeorologicheskim biuro Voronezh.** [Service to organizations in the national economy furnished by the Voronezh Hydrometeorological Office.] *Meteorologiia i Gidrologiia*, No. 1:42–43, Jan. **1957. DWB, DLC**—A detailed description of the operations of the Voronezh weather station is presented. Forecasts are issued twice daily 0700 and 1400 hrs with the daily forecast being issued in the morning. The daily bulletin contains a 24 hr forecast from 1000 to 1000 hrs, a three day forecast, and a review of preceding weather. Forecasts are prepared daily at 1400 for the interval 1900 to 1900 hrs and are transmitted by telephone. The quality of the forecasts is improved as the forecasters become familiar with the physiographic characteristics of the area. Twice yearly, during the fall and spring, the forecasters make a special study of special weather processes prevailing during winter and summer. For the special benefit of farmers, weather reviews such as **Weather and sowing** are published every year. *Subject Headings:* **1. Voronezh Hydrometeorological Office 2. Voronezh, U.S.S.R.**—*I.L.D.*

10.2–62 551.5:061.6

Davitaia, F. F., **Meteorologicheskaia sluzhba Brazilii.** [Meteorological Service of Brazil.] *Meteorologiia i Gidrologiia*, Leningrad, No. 3:60–63, March **1957.** 3 photos, 4 footrefs. **DWB, DLC**—While a delegate to the 18th International Geographical Congress (1956), the author made a brief survey of the Brazilian Meteorological Service. The author describes the organization of the Brazilian meteorological service, the scope of its network, the types of observations taken and the instruments used, the meteorological data that are published, meteorological training and the meteorological observations, with particular reference to microclimatic observations carried out on a private plantation near Pernambuco. The disposition of the meteorological instruments at the Central Meteorological Station in Rio de Janeiro is illustrated by photographs. *Subject Headings:* **1. Brazilian Meteorological Service 2. Brazil.**—*I.L.D.*

EDUCATION, HISTORY AND BIOGRAPHY

HISTORY

See: **IGY and education** (Michelson), 10.2–51.

BIBLIOGRAPHY—TERMINOLOGY

See: **Jet stream characteristics** (Berggren et al.), 10.2–17.

PRACTICAL AND APPLIED METEOROLOGY

OCEANOGRAPHY AND MARINE METEOROLOGY

See also: **Marine met. textbooks** (Briones Viejobueno), 10.2–4; **Ocean wave spectra** (Longuet), 10.2–25; **Submarine exploration** (Doukan), 10.2–34; **Air-sea rescue operations and human survival in Antarctic waters, New Zealand-McMurdo Sound Airway,** 10.2–48; **International Oceanog. Congress, Sept. 1959, N.Y.C.,** 10.2–60; **Evaporation from seas, Japan** (Ito), 10.2–194; **Sea fog** (Ogata, Tamura), 10.2–275; **Rainfall measurements and Netherlands weather ship data** (Verploegh), 10.2–286.

10.2–63 551.556.8:551.465

Hassan, E. M., **On the wind driven ocean circulation.** *Deep-Sea Research,* London, 5(1):36–43, May **1958.** 4 figs., 13 refs., 13 eqs. **DWB**—A model of a wind driven ocean was considered to determine the vertical structure of the horizontal currents. The most restrictive assumptions were the absence of vertical motion and the constancy of the coefficient of exchange of momentum. The results of the model indicate a strong counter current under the intense western current. They also indicate that the current pattern in three dimensions is cellular. *Subject Headings:* **1. Oceanic circulation models 2. Ocean currents 3. Wind driven currents.** —*Author's abstract.*

10.2–64 550.342:551.556.8:551.46

Nanda, J. N.; Achyuthan, K. and Balachandran, N. K. (*all, Off. of Sci. Res. and Dev., Naval Headquarters, New Delhi*), **Periodicity in sea roughness and origin of microseisms.** *Nature,* London, 181(4609):646, March **1958.** 2 refs. **DWB**—The hypothesis that microseisms may be caused by means of the interaction of wind and sea roughness leads to the conclusion that the periods in microseisms should correspond to any autocorrelative periods in sea roughness. The resulting radar clutter (which increases in amplitude with sea roughness) was measured with a 10 cm radar in order to estimate sea roughness. The technique of observation is described briefly. The computed autocorrelogram showed strong periods of 0.8 sec and 4.6 sec. "There was an indication of a weak period also at 1.2 sec." Periods in sea roughness produce corresponding periods in eddy viscosity at the sea surface. "This causes periodic changes in wind stress over the sea provided the winds are cyclonic or suitably oriented near a coast line. Such changes cause pulsations in pressure over wide areas at the sea bottom." Also the Longuet-Higgins theory is summarized. *Subject Headings:* **1. Sea surface roughness periodicities 2. Microseisms from rough seas 3. Wind effects on water surfaces.**—*I.L.D.*

10.2–65 551.46

†Selitskaia, E. S., **K voprosu o vnutrennikh volnakh.** [The problem of internal waves.] *Meteorologiia i Gidrologiia,* Leningrad, No. 6:35–39, June **1957.** 2 figs., 2 tables, 14 refs. **DWB**—A brief summary is given of the history of observations on internal waves since F. NANSEN. Essentially, the process of internal waves consists of the periodic vertical motions of a boundary surface between two layers of water of differing density: during observations at a point, these movements are perceived as the movement of a wave. In this article the author analyzes a striking example of internal waves observed in the North Sea. The analyzed material consists of hourly observations of temperature and salinity made at three semidiurnal stations, on June 6, 9 and 12, 1951, on a floating light ship situated at 54°00′N lat. and 3°32′E long. Two homogeneous water layers, separated by a sudden temperature jump between 10 and 20 m (shown in a table and graph), were observed. The temperature and salinity in the 15 m horizons were subjected to harmonic analysis and by means of the computed harmonic constants M_2, S_2 and M curves for the computed data were constructed and then compared with curves of the observed data. In general, the computed curves reflect the observed variations of the hydrologic elements with time. A comparison of the phase angles of temperature and salinity in the layer of sudden change with the phase angles of internal tides shows that the latter differ considerably from those of the former since there is no simple relationship between temperature and salinity. The amplitude of the internal waves can be computed both from internal temperature and internal salintiy waves. *Subject Heading:* **1. Internal waves.**—*I.L.D.*

10.2–66 532.59:551.46:662.2:539.1

Oliver, Jack and Ewing, Maurice (*both, Lamont Geol. Obs., Palisades, N. Y.*), **Short-period oceanic surface waves of the Rayleigh and first shear modes.** *American Geophysical Union, Transactions*, 39(3):482–485, June **1958.** 4 figs., 6 refs. **DWB, DLC**—Waves corresponding to the short-period segment of the Rayleigh mode and to the first shear mode are identified for paths traversing the deep ocean, apparently for the first time. It appears that the reason for the presence of the waves in this case and their conspicuous absence in all other cases is that (a) the shock which excited these waves is the atomic explosion of Operation Wigwam, deep in the Pacific Ocean; (b) earthquake sources are generally too deep to excite short-period surface waves efficiently. The new data strongly support the normal mode explanation for the dispersion of Rayleigh waves crossing the Pacific Ocean and furnish supporting evidence for the crustal structures previously deduced from surface wave dispersion and from refraction shooting. The unusual characteristics of the body phases and the T phase may probably be explained, as well, by assuming the source was within the water layer. *Subject Headings:* **1. Rayleigh waves 2. Ocean waves 3. Internal waves 4. Atomic explosion waves in ocean.** —*Authors' abstract.*

10.2–67 551.462:546.45:551.521.64

Goel, P. S.; Kharkar, D. P.; Lal, D.; Narsappaya, N.; Peters, B. and Yatirajam, V. (*Natl. Chem. Lab., Poona, India*), **The beryllium-10 concentration in deep-sea sediments.** *Deep-Sea Research*, London, 4(3):202–210, **1957.** 3 tables, 9 refs. **DWB**—The cosmic ray-produced radioactive isotope ^{10}Be (half-life 2.7 million years) has been discovered in the upper and lower portions of a 15 m long core from the sediment of the Pacific Ocean. If the investigated core represents sedimentation which has remained physically and chemically undisturbed for several million years, the following tentative conclusions can be drawn: the measured concentrations of ^{10}Be in layers at various depth indicate a sedimentation rate of about 5 mm/1,000 yrs which is not far from current estimates. The concentration in the upper layers leads to a present-day deposition rate of 2.55×10^{10} ^{10}Be nuclei/cm^2 year, in excellent agreement with estimates based on the ^{7}Be contents of rainwater. The decrease of concentration with depth indicates an intensity of cosmic rays in the past which has changed not at all or very slowly during the last ca. 2.5 million years. *Subject Headings:* **1. Beryllium-10 production by cosmic rays 2. Beryllium-10 in deep sea sediments.**—*Authors' abstract.*

10.2–68 551.463/4:551.510.721

Miyake, Y. (*Met. Res. Inst., Tokyo*), **Methods for the measurements of radioactivity in sea water.** *International Geophysical Year*, 1957/1958, *Annals*, 5(IGY Instruction Manual), Pt. 5:359, **1958. DWB**—The man-made radioactive elements in sea water are co-precipitated with a small amount of iron and barium from sea water, as hydroxide and sulphate respectively. The efficiency of co-precipitation is about 60 percent but differs according to the composition of fission materials. The method was applied to measure the distribution of the radioactivity in the North Pacific Ocean. In addition, the method of radio-chemical analysis of sea water is described. *Subject Headings:* **1. Radioactivity measurement techniques 2. Radioactivity in sea water 3. Radio-chemical analysis of sea water 4. North Pacific Ocean.**—*Author's abstract.*

10.2–69 551.5:551.46(266)

†*Roden, Gunnar I., **Oceanographic and meteorological aspects of the Gulf of California.** *Pacific Science*, Honolulu, 12(1):21–45, Jan. **1958.** 19 figs., 4 tables, 27 refs. **DWB, DLC**—The basic knowledge of water temperatures, salinity, bathymetry, currents, upwelling and of climatic conditions including temperature, wind, hurricanes, evaporation and rainfall as obtained from Scripps expeditions and from records of the Servicio Meteorológico Mexicano, U. S. Coast and Geodetic Survey and U. S. Hydrographic Office is summarized. Many isothermal, isohaline, wind, and evaporation charts, graphs of annual air and sea surface temperature, salinity and evaporation regime, bathythermal cross sections, current charts, etc. are presented. The Gulf of Calif. is said to be the only natural evaporation basin in the Pacific area. *Subject Headings:* **1. Oceanographic meteorology 2. Evaporation 3. Climate of Gulf of California 4. Gulf of California.**—*M.R.*

10.2–70 551.46.018 551.461

Brémond, J. C., **Etude statistique des hauteurs des nappes d'eau résultant du choc des vagues sur une paroi rocheuse.** [Statistical study of the heights of surf resulting from the impact of waves on a rocky wall.] *Académie des Sciences, Paris, Comptes Rendus,* 245(19): 1643–1645, Nov. 4, **1957. DLC**—Elaboration of an experimental rule expressive of the distribution of the frequencies of the different heights reached by surf resulting from the impact of waves on a rocky wall. For this purpose, the author used in Arago's Laboratory, at Banyuls, a recording apparatus which permits measurements of the immersion times at various reference-levels, and calculates the frequencies of water-sheets which reach those different levels, one of them agreeing with the level of the sea in repose. The distribution rule of the heights reached by surf agrees satisfactorily with a Poisson distribution:

$$P_k = e^{-\lambda}\frac{\lambda^k}{k!}$$

in which: k = altitude class of considered reference-level; λ = most probable height reached by the surf; P_k = probability factor of the surf number reaching the class k. *Subject Headings:* **1. Oceanographic instruments 2. Oceanographic research.**—*A. V.*

GLACIOLOGY AND ICE

See also: **General circulation during Pleistocene glaciation** (Ewing, Donn), 10.2–44; **Snow pit studies, Fair Weather Bay, Antarctica** (Swithinbank), 10.2–47.

10.2–71 551.311.12

Glen, J. W. (*Dept. of Physics, Birmingham Univ.*), **Measurement of the slip of a glacier past its side wall (Cambridge Austerdalsbre Expedition 1955–57, Paper No. 4).** *Journal of Glaciology,* London, 3(23):188–194, March **1958.** 2 figs., 7 refs. English and German summaries p. 188. **DWB, DLC**—The velocity of flow of a glacier was measured at two places where the ice margin had no moraine debris between clear ice and unfragmented rock. In one of these places the point at which the measurement was made was only about 1 m from the solid rock. It was found that at both sites the ice was flowing past the rock at a velocity of the same order of magnitude as the velocity of flow in the center of the glacier in this region. Although conditions at the side of a glacier are not the same as at the bed, this large amount of slip is evidence for a high rate of slip all along the ice-rock interface, and this is in accordance with current ideas of the flow of ice below ice falls. *Subject Headings:* **1. Glacier movement 2. Cambridge Austerdalsbre Expedition, 1955–57.**—*Author's abstract.*

10.2–72 551.464:551.311.1

*Gorham, Eville (*Freshwater Biol. Assoc., Ambleside*), **The salt content of some ice samples from Nordaustlandet (North East Land), Svalbard.** *Journal of Glaciology,* London, 3(23): 181–186, March **1958.** fig., 2 tables, 8 refs. English and German summaries p. 181. **DWB, DLC**—Analyses for pH, $Na+$, $K+$, $Ca^{2}+$, $Mg^{2}+$, HCO_3-, $Cl-$, $SO_4{}^{2}-$ and NO_3- have been made on land ice samples from Nordaustlandet, Svalbard. Total ions range from less than 0.02 to 0.46 milliequivalents per liter, with sea salt generally the dominant component although calcium and magnesium bicarbonates are relatively more abundant in a surface sample heavily contaminated by soil material from an adjacent moraine. These ions, as well as potassium and sulphate, are present in most samples in excess of possible sea-spray supply. From the surface of a crevasse to 14 m depth down one side the concentrations of all ions except nitrate fluctuate in a similar manner. Some possible implications of the results are examined. *Subject Headings:* **1. Ice composition 2. Salt content of land ice 3. Svalbard.** —*Author's abstract.*

10.2–73 551.311.2

†Korzhuev, S. S. and Timofeev, D. A., **Rechnye bechevniki i rol' rechnogo l'da v formirovanii ikh mikrorel'efa.** [River towpaths and the role of river ice in the formation of their microrelief.] *Akademiia Nauk SSSR. Institute Geografii, Trudy,* 68:69–95, **1956.** 8 figs., 2 tables, refs. p. 94–95. **DLC**—The history of the studies of the ice action upon river bank is

reviewed briefly and with particular reference to the rivers of southern Iakutiia. A discussion is presented of the types of rises, towpaths and the processes involved in the formation of such towpaths and their microrelief, including the erosional accumulation activity of the river current, river abrasion, and the work of river ice. Photographs and diagrams accompany the test. *Subject Headings:* **1. River erosion 2. Ice erosion.**—*I.L.D.*

ASTRONAUTICS—SATELLITE OBSERVATORIES

10.2–74 551.506.22:551.507.362.2

Strong, James, **Project Vanguard.** *Aeroplane*, London, 92(2391):919–932, June 28, **1957.** figs., photos. **DLC**—Technical and scientific aspects of the IGY earth satellite program of the U. S. are discussed in detail in six articles: 1) Rockets, satellites and the IGY program (high-altitude rocket research, artificial satellites, the scientific value of satellites), 2) The Vanguard vehicle (technical description with diagrams), 3) Earth satellites (design criteria), 4) Ascent into space (launching site and equipment, choice of orbit, speculation on Russian orbit), 5) Tracking the satellite (minitrack, data transmission, optical search, power supplies) and 6) Research in space (scientific information sought, what is known of the upper atmosphere, instrumentation needed for various projects, future possibilities). *Subject Headings:* **1. Project Vanguard 2. IGY satellite program.**—*G.T.*

10.2–75 551.507.362.2

Sedgwick, Jackson L., Jr. (*Ballistic Research Labs., Aberdeen Proving Ground, Md.*), **Interpretations of observed perturbations on a minimal earth satellite.** (In: Van Allen, James A. (*ed.*), **Scientific uses of earth satellites.** Ann Arbor, Univ. of Michigan Press, **1956.** p. 44–48. 3 refs., 8 eqs.) **DWB, DLC**—Mathematical solution of problem of perturbation in orbit of satellite due to oblateness of the earth and the resistance of the atmosphere (atmospheric drag). Effects due to sun and moon are neglected. *Subject Headings:* **1. Atmospheric drag effect on satellite 2. Satellite orbits.**—*M.R.*

10.2–76 551.507.362.2:803

International Physical Index, Inc., N. Y., **The Russian literature of satellites, Pt. 1.** Issued **1958.** 181 p. This is a translation of the first six articles in the Russian journal, *Uspekhi Fizicheskikh Nauk*, Moscow, Vol. 63, Pt. 1a, Sept. **1957.** p. 5–122. **DWB** (629.1388 1611ru). Review by S. F. Singer in *Physics Today*, 11(11) 40–42, Nov. **1958. DLC.** For listing of articles in this Russian journal, *see* Pt. III, p. 384, March 1958, *MAB*. All these articles abstracted separately. *Subject Headings:* **1. Satellite observatories 2. Translations.**

GEOMAGNETISM AND GEOELECTRICITY

See also: **Magnetic effects on convection** (Jirlow), **10.2–189.**

10.2–77 550.384:523.16:629.135.2

Global flight to determine the earth's magnetic field. *Science*, Wash., D. C., 124(3223): 620–621, Oct. 5, **1956.**—Air Research and Development Command announced a world-circling expedition to determine the shape of the earth's magnetic field. A Boeing KC-97 left Bedford, Mass. under auspices of ARDC, SAC and Univ. of Chicago. A 1500 lb. cosmic ray meter will be taken on the 90,000 mi trip to measure cosmic ray intensity at equator, from which shape of outer magnetic field can be mapped. *Subject Headings:* **1. Shape of geomagnetic field 2. Cosmic ray intensities 3. Airplane observations.**—*M.R.*

10.2–78 550.38:519.2

Shapiro, Ralph (*A. F. Cambridge Res. Center*), **Persistence correlations and geomagnetism.** *Colorado. Univ. High Altitude Obs. Inst. for Solar-Terrestrial Research, Technical Report*, No. 1, **1956.** Lecture No. 16. 4 p. 2 refs. **DWB**—Brief discussion of the analytical results of 16,952 persistence correlations over the period Jan. 1, 1899 through May 31, 1945. Flares seem to penetrate to lower levels (about 50 km) than does the corpuscular effect. Several

other ways to utilize these data for statistical analysis are suggested. *Subject Headings:* **1. Solar flare effects on geomagnetism 2. Persistence correlations 3. Statistical analysis.** —*W.N.*

10.2–79 539.15:538.63

Åström, Ernst (*Royal Institute of Technology, Stockholm*), **Electron orbits in hyperbolic magnetic fields.** *Tellus*, Stockholm, 8(2):260–267, May 1956. 4 figs., 10 refs., 32 eqs. **DLC**—Electron motion in the field from cylindrical pole pieces with the section in the shape of a rectangular hyperbola and its conjugate is treated. The accessible region is discussed. For the motion in the asymptote planes to the hyperbola the orbits are characterized by two parameters, e.g. one (k), characterizing the shape, and the other the amplitude. The solution is given in elliptic functions. The orbits may be divided into two groups, one composed of orbits resembling trochoids, and the other orbits of a meander type. There exists a periodic orbit similar to the digit 8. The drift is in opposite directions on different sides of this orbit, as characterized by k. The trochoidal motion is stable if the orbit is not stretched too much. For the meander orbits the criterion used gives a main stability region. This region is bounded by the periodic orbit and the orbit the branches of which just touch each other. For both groups of orbits there exists an infinite number of stable regions. *Subject Headings:* **1. Electron orbits 2. Magnetic field effects.**—*Author's abstract.*

10.2–80 550.387

Turlygin, S. Ia and Karelina, N. A., **Vliianie sushi i moria na raspredelenie prirodnykh elektricheskikh tokov po poverkhnosti zemli.** [Influence of continent and seas on distribution of natural electric currents on the earth's surface.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 4:55–75, **1952.** 11 figs., table, 10 refs., 23 eqs. **DLC**—Electrical currents in the surface layer of the earth are considerably modified by the distribution of land and sea. The authors discuss theoretical models (oceans as ellipsoids) and shows actual laboratory measurements made with models of a sea bay, of the Black Sea and Europe. The density of the sea current for a shallow ocean is hundreds of times greater than that of the continent and equal to a deep ocean. *Subject Headings:* **1. Earth currents 2. Laboratory models 3. Europe 4. Black Sea.**—*A.A.*

10.2–81 550.387

Veshev, A. V.; Semenov, A. S. and Novozhilova, M. E., **Novyĭ vid estestvennogo elektricheskogo polia v zemle.** [A new type of a natural electric field in the earth.] *Akademiia Nauk SSSR, Doklady*, 87(6):939–941, **1952.** 4 figs. **DLC**—The new type of natural electrical field, first observed in connection with poor reproducibility of observation and the presence of narrowly localized positive anomalies of the natural electrical field, is characterized by instability with time. The electric potential varied with time of day; high positive potential values were recorded in early morning hours, they diminished and became even negative in the afternoon. The character of the potential curves in the afternoon is influenced by air temperature; the potential may decrease to −150 and −200 mv on very hot days. *Subject Heading:* **1. Terrestrial electrical field.**—*I.L.D.*

10.2–82 550.387

Petracchi, Gernando, **Le correnti telluriche.** [Earth currents.] *Geofisica e Meteorologia*, Genoa, 2(5/6):77–79, Sept./Dec. **1954. DWB**—A review of various ideas on the nature of the earth currents and of the characteristics of the earth currents and their relation to geological (mineralogic stratification), morphological (orography, water courses, etc.) and meteorological (temperature, precipitation) features and to solar activity. *Subject Heading:* **1. Earth currents.**—*I.L.D.*

10.2–83 550.387

Yoshimatsu, Takasaburo (*Kakioka Magnetic Observ.*). **Index C_e of earth-current activity.** *Japan. Science Council. Ionospheric Research Committee, Report of Ionosphere in Japan*, 5(4):187–188, **1951. DWB**—A system of indices is proposed using the numbers 0,1,2 . . . 9, similar to that of geomagnetic K-indices. *Subject Heading:* **1. Earth currents.**—*A.A.*

10.2–84 550.389

Fougere, P. and McClay, J., **Preparation of mutually consistent magnetic charts.** *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers,* No. 55, June **1957.** 39 p. fig., 11 tables, 9 refs., numerous eqs. **DLC, DWB**—The total magnetic intensity vector field of the earth satisfies two pertinent conditions: (1) the radial component of the curl vanishes and (2) the square of the magnitude of the vector is equal to the sum of the squares of the spherical components. Each element of the vector is expanded about a point in a quadratic polynomial. The conditions are then used to yield relations among the polynomial coefficients. The independent set of coefficients is then determined by the method of least squares. A hypothetical problem is designed, in which sets of values of the elements on a grid are determined from analytic expressions. The method just developed is applied to find the numerical coefficients. These compare very well with coefficients obtained directly from the analytic expressions. The fit of the resulting set of polynomials to the data is then determined with excellent results. Finally, the techniques developed for quadratic fields are generalized in such a way that fields of any degree of complexity may be handled in a straightforward manner. An Appendix gives an extension of the method to yield consistent isoporic charts. *Subject Heading:* **1. Magnetic charts.**—*Authors' abstract.*

AERONAUTICAL METEOROLOGY

See also: **Aeronautical met. textbooks** (Viaut), 10.2–5; **Air-sea rescue operations and human survival, Antarctic waters, New Zealand-McMurdo Sound Airway,** 10.2–48.

10.2–85 551.508.94:629.135

Vonnegut, Bernard; Moore, C. B. and Sykes, W. G., **A simple navigational device to aid aircraft to avoid thunderstorms.** Arthur D. Little, Inc. (1957?). 6 p. 4 figs. **DWB** (M629.1325 V947si)—Intense electric fields near thunderstorms may be used to detect proximity to and thus avoid hazardous flight through thunderstorms. A simple null indicating meter and probe is described and illustrated schematically. The equipment was tested several times during July 1955 using different kinds of planes in different regions from Texas to Cape Cod and Minnesota. Details of these flights are described. *Subject Headings:* **1. Electric field meters 2. Thunderstorm avoidance.**—*M.R.*

10.2–86 551.574.7:629.13

Samuels, L. T. (*U. S. W. B.*), **Meteorological conditions during the formation of ice on aircraft.** *U. S. National Advisory Committee for Aeronautics, Technical Note,* No. 439, Dec. **1932.** 20 p. 5 figs., 4 tables, 12 refs., bibliog. p. 18–19. **DWB**—After a discussion of the various forms of ice found on aircraft (clear, rime and frost), there is a discussion of the effects of ice on airplanes and an analysis of airplane (APOB) observations made by the U. S. Weather Bureau. Sudden deposits, triple-point, supercooled water drops, several ways ice may form, size of droplets and Antarctic conditions are also discussed. Detailed flight observations during 1931 and 1932 at Chicago, Cleveland, Dallas and Omaha are presented and furnish the basis for statistical and graphical analysis of icing incidence vs. temperatures at which ice began and temperature range through which clear ice and rime formed vs. height intervals and vs. cloud forms or weather condition. *Subject Headings:* **1. Icing of aircraft 2. Aircraft icing data 3. Chicago, Ill. 4. Cleveland, Ohio 5. Omaha, Neb. 6. Dallas, Tex.**—*M.R.*

10.2–87 551.551:629.13

Eggleston, John M., **Calculation of the forces and moments on a slender fuselage and vertical fin penetrating lateral gusts.** *U. S. National Advisory Committee for Aeronautics, Technical Note,* 3805, Oct. **1956.** 20 p. 3 figs., table, 8 refs., 14 eqs. **DWB, DLC**—A theory is presented for calculating the variation with frequency of the lateral-force and yawing-moment coefficients due to sinusoidal side gusts passing over the profile of a simple fuselage—vertical-fin combination. The analysis is based on slender-body theory. The method considers the penetration effect of both fuselage and vertical tail in calculating side force and yawing moment due to side gusts, as opposed to a simple lag concept which considers the flow angle to be uniform over the configuration. *Subject Heading:* **1. Gust effects on airplanes.** —*Author's abstract.*

10.2–88 551.551.25:629.13

Bullen, N. I., **Aircraft loads in continuous turbulence.** *North Atlantic Treaty Organization. dvisory Group for Aeronautical Research and Development, Report,* No. 116, April/May **1957.**) p. 7 figs., 9 tables, 9 refs., eqs. **DWB** (629.1308 N864r)—Turbulence sufficient to activate counting accelerometer usually occurs in short bursts of average duration of the order of lf a minute. There is evidence to suggest that the distribution of aircraft normal acceleration not usually Gaussian, even for very short periods of time, but follows the form of a modified essel function, and gives rise to an exponential distribution of peak values. From the stribution of peak values the root-mean-square value of the variable (normal acceleration) n be determined. It is found that the root-mean-square tends to take one of two discrete lues, the ratio between them being about 0.6. Where the duration of turbulence has been easured directly, or can be inferred, the number of zero crossings per second of the variable n also be found from the peak distribution. Two examples of this are given, each for two tensities of turbulence. The close agreement between the values in the two intensities of rbulence provides some evidence in favor of the view that the shape of the power spectrum independent of intensity, at least over a limited range. In one case the power spectrum has eviously been determined and it is possible to estimate the total time spent in turbulent nditions. *Subject Headings:* **1. Power spectra 2. Aircraft response to atmospheric tur- ılence 3. Gust loads.**—*Author's abstract.*

AGRICULTURAL METEOROLOGY

See also: **Agromet. conferences, Ukrainian S.S.R.** (Gavrilenko), 10.2–57; **Evapotranspiration** (Shanbhag), 10.2–261; **Evapotranspiration estimates** (Suomi, Tanner), 10.2–262.

10.2–89 551.582.1(51) 551.5:63

Tsiang, P. J., **Climate of North China and its relation to agricultural products.** *Chinese ssociation for the Advancement of Science, Taipei, Taiwan, China, Bulletin,* 2(3):26–29, ɔril **1954. DWB**—The author presents a brief description of the climate of Hopeh, Honan, ıantung and Shansi provinces with particular reference to agricultural development. The matic provinces of North China according to the Köppen classification, the role of the ɔnsoon in the climate of North China and a description of the characteristics of the individual eteorological variables are presented. *Subject Headings:* **1. Climate of North China 2. Agri- ltural meteorology 3. Köppen's classification 4. North China.**—*I.L.D.*

10.2–90 551.556:633.18(52)

Ujiie, S.; Miyamoto, K. and Kojima, Z. (*Miyagi Agric. Experiment Station*), **Damages the rice grains caused by wind storm at the heading period.** *Journal of Agricultural Me- rology,* Tokyo, 12(1):1–4, July **1956.** 4 figs., 8 tables, 11 refs. In Japanese; English mmary p. 4. **DWB**—At the Miyagi Agricultural Experiment Station we investigated the mage to rice grain caused by wind storm at the earing period, from 1949 to 1954, and found e following results: 1) There is a close connection between wind velocity on the paddy field d that of the wind tower. According to the measurement of wind velocity of the wind tower, could pressure-gage the wind velocity on the paddy-field. 2) The degrees of damage by nd storm vary according to the distance from flagleaf to spike; with the C-type most damaged, lowed by the Band D types. 3) With an increase of the discolored spiklet, the weight of the al grains and the quality of the grains decrease. The tendency to decrease is especially evalent in the year of low temperature. 4) The relation of the estimation of the yield loss rice (y) and the percentage of discolored spiklet (x) is shown by the following formula:

$$y=2.523+0.599\,x+0.028\,x^2$$

bject Headings: **1. Wind damage to rice heading 2. Rice culture 3. Japan.**—*Authors' stract.*

10.2–91 551.577:551.586:633

de Ferrière, J. F.; Gamez, T. and Millot, G., **Types d'argile des sols, pluviosités et nutrition assique de la pomme de terre et du blé.** [Clay soils, rainfall and potassic fertilization of tatoes and corn.] *Académie des Sciences, Paris, Comptes rendus,* 245(18):1561–1563, Oct.

28, 1957. **DLC**—Tests of long lasting potassic fertilizers on potato and corn cultures, made o ten clayey fields presenting varied mineralogical compositions. Annual yields are studie as related to rainfall, the mineralogical nature of the clay and the importance of potass fertilizers. *Subject Headings:* **1. Crop yield 2. Rainfall influences.**—*A.V.*

10.2–92 595.787 551.586:638.

†Yamazaki, H.; Nishimura, K. and Yamada, T., **Influence of shortening or prolongatio of hibernating period of pupae upon the emergence, development and voltinism of succeedin stage in Antheraea pernyi Guérin (Pt. 2 of Studies on the influence of the temperature upo the development of the wild silkworm).** *Journal of Agricultural Meteorology*, Tokyo, 10(1/2 23–26, Dec. **1954.** 8 tables, 25 refs. In Japanese; English summary p. 26. **DWB**—1. Th article dealt with the effect of artificial shortening and prolongation of the period of hibernatio of *Antheraea pernyi* pupae upon the emergence of the adult, and the development of the larv the voltinism and the characteristics of the cocoon (namely: cocooning, the weight of cocoo and cocoon layers) in the second generation. 2. The first emergence of the adult, either univoltine or bivoltine brood, begins after an elapse of 19 to 26 days by keeping the pupa und temperature of 20° to 21°C from Dec. 10th. The period and the duration of emergence ar shortened by keeping the pupa at the above described temperature at a later (Jan. 27th rather than earlier date (Jan. 10th) by which the dormancy of the pupa is easily broken. Th percentage of emerging moths is not affected by the length of hibernation. It can be see visibly that the univoltine brood pupae require longer time before the beginning of adu appearance and the percentage of emerging moths is much larger than those of bivoltine broo The duration of emerging perfectly in both broods is similar. 3. By artificial prolongatio of the hibernating period, the following effects are noted: a) The duration between the eme gence of the adult and the hatching of the larva is shortened and the percentage of emergi moths became less. The duration of emergence and number of deposited eggs is norma b) The secondary larval stage is shortened; c) The ratio of good cocoons is reduced; the weig of cocoon, cocoon layer and the ratio of cocoon layer are increased; d) The percentage hibernating pupae in the second generation is increased. *Subject Headings:* **1. Temperatu effects on silkworms 2. Silkworm culture.**—*Authors' abstract.*

10.2–93 551.5:633.

*Shashina, E. I., **Agrometeorologicheskie uslovia rosta i razvitiia ozimykh v vesenne-letn period na territorii orosheniia Kuĭbyshevskogo gidrouzla.** [Agrometeorological conditio during the growth and development of winter crops in the spring-summer period in the irrigate territory of the Kuibyshev hydroelectric network.] *Moscow. Tsentral'nyĭ Institut Prognoz Trudy*, 29(56):93–105, **1953.** 26 tables. **DLC**—The agricultural-meteorological conditio for the growth and development of winter rye during the spring-summer periods based up meteorological observations made at 16 stations for a period of 18 yrs. These included a temperature, precipitation, atmospheric moisture deficiency at 1300 h, soil moisture and al observation on growth, development and conditions of the plants. Meteorological and pla data were examined for the following periods: resumption of growth and the appearance of t stem; from appearance of the stem to flowering; and from flowering to waxy ripeness. E tensive data are presented in tables. *Subject Headings:* **1. Agricultural meteorology 2. Cr ecology 3. Rye culture 4. Kuibyshev Region.**—*I.L.D.*

10.2–94 551.584.6:633.

Mihara, Y. and Ōnuma, K. (*both, Div. of Met., Natl. Inst. of Agric. Sci.*), **On the heat a water vapour-transmissivity of the frame paper and their effect on the temperature in the ri seedling bed.** *Journal of Agricultural Meteorology*, Tokyo, 12(3):105–107, Jan. **1957.** 3 fig 2 tables, 2 refs., 5 eqs. In Japanese; English summary p. 107. **DWB**—The relationsh between the transmissivities of heat and water vapor of the frame paper and the temperatu in the rice seedling bed was studied. Five kinds of frame paper, the transmissivities of whi differed from each other, were prepared and used to cover the rice seedling beds, respectivel This experiment was made at two periods, 6–19 April and 6–17 May. The temperature various depths under the paper and general climatic factors were measured for above perio Daily maximum ground temperature at seeded layer (about 1 cm in. deep from the bed surfa

directly proportional to the daily maximum air temperature, and the values of proportion fficient "*k*" on five beds were adopted as the indicators of warmth keeping power of each per, and they were shown in a table. The relationship between the values of "*k*" and three ysical properties, heat transmissivity, water vapor transmissivity and aeration, is also own in a fig. It shows that water vapor transmissivity is rather more effective on the rmth keeping than heat transmissivity, and that the aeration of paper has no relation to the t budget. *Subject Headings:* **1. Frame microclimatology 2. Rice culture.**—*Authors' tract.*

10.2–95 551.577:63

*Mallik, A. K. (*Met. Office, Poona*), **An examination of the crop yields at crop-weather tions with special reference to rainfall.** *Indian Journal of Meteorology and Geophysics*, w Delhi, 9(1):1–8, Jan. **1958.** fig., 9 tables, ref. **DWB, DLC**—The author discusses some standing examples of the effect of rainfall upon the yield of paddy, wheat, jowar and cotton ps over large contiguous areas in various parts of India over a period extending from 1946/47 1954/1955. Tables giving the average yield in different years for each crop station, the ld values of paddy, wheat, jowar and cotton crops, respectively, at each station and in each r, the rainfall during Aug. and Sept. of 1947–48 and 1950–51, and rainfall and rainy days various years and in various districts where jowar and cotton, respectively, are cultivated presented. A map showing the rainfall distribution in India during Nov. 1946 is included. thor concludes that the broad effects of rainfall on the yield of crops may be helpful in essing crop outlooks, though qualitatively, if and when in the future rainfall similar to t described occurs. *Subject Headings:* **1. Rainfall effects on crop yield 2. Rainfall data India.**—*I.L.D.*

FIRE WEATHER AND FOREST METEOROLOGY

10.2–96 551.5:632.187

*Shepard, H. B. (*Pacific Northwest Forest Experiment Station*), **Influence of local climate forest fire hazard in the Douglas fir region.** Portland, Oregon, Pacific Northwest Forest periment Station, Dec. 10, **1931.** 11 p. 6 figs., tables. **DWB** (M86:634 S547in)—The risk is considered as a complex of factors which act together to increase the chance of a starting or spreading. These factors are: 1) precip. amount, 2) length of drought, 3) num- of days with low relative humidity, 4) degree of low relative humidity, evaporation rate, d, lightning and temp. Some elements (lightning) are causative hazards and others (e.g., cip.) are a climatic hazard. Wind and evaporation were omitted due to lack of data. ta for 141 stations in western Wash. and Oregon for 1921–30 were used (70 with precip. y, 55 relative humidity only, and 16 both). Maps were drawn dividing the region into imatic zones for each of the 5 elements and then for combination of these elements. Zone V ns out to be four times worse than Zone I. *Subject Headings:* **1. Fire risk zones 2. Fire ather studies 3. Western Washington 4. Western Oregon.**—*M.R.*

10.2–97 551.584.41(795)

*Macnab, James A. (*Portland State College*), **Biotic aspection in the coast range mountains northwestern Oregon.** *Ecological Monographs*, Durham, N. C., 28(1):21–54, Jan. **1958.** figs. (incl. photos), 10 tables, 78 refs. **DLC**—In this extensive study of the ecology of a gin fir-hemlock forest area of the Coast Range of Oregon, the climate of the area is briefly marized. Average annual rainfall is 90 in. or more. Summers are dry. Snow is not quent and much of the precip. is from condensed fog dripping from the trees. Rain bearing es from the S.W. are frequent from Oct. to April, but winds are very light within the forest n during the strongest gales. Average annual temp. is 50°F, ranging from an extreme low 1°F to a high of 89°F. Rarely does the temp. exceed 70°F. Soil rarely freezes in forest. trumental observations were made from 1932 to 1938. Meteorological data are extensively intensively analyzed and presented in graphic and tabular form for the year and by seasons connection with insect development, diseases and other forest environmental factors. mp. and humidity are considered the two most significant meteorological variables. Pheno- cal relationships are also discussed at length. A good bibliography is appended. *Subject*

Headings: **1. Forest microclimatology 2. Phenology of forests 3. Ecology 4. Coast Range Northwest Oregon.**—*M.R.*

10.2–98 551.584.31:551.577.51(931):634.9

*†Wardle, P. and Mark, A. F. (*both, Botany Dept., Otago Univ.*), **Vegetation and climat in the Dunedin District.** *Royal Society of New Zealand, Transactions,* 84(1):33–44, Oct. **1956** fig., 2 maps, 2 tables, 15 refs. **DLC**—A thorough analysis is presented of data from rainfall evaporation, fog and temperature records from temporary stations at different sites on slope of the Silver Peak District near Dunedin, New Zealand at elevation from 300 ft to 2750 f in connection with vegetation types and forests. Changes in vegetation type seem to hav occurred shortly before the settlement by white men. Rainfall, temp. and evaporation seen to diminish with elevation above 2000 ft. Marked inversions occur over grasslands. *Subjec Headings:* **1. Slope micrometeorology 2. Forest climatology 3. Altitude effects on precipita tion 4. Dunedin District, New Zealand.**—*M.R.*

10.2–99 551.573:551.5:581.19:634.

Yamaoka, Yoshito (*Faculty of Eng., Yamaguchi Univ., Japan*), **The total transpiratio from a forest.** *American Geophysical Union, Transactions,* 39(2):266–272, April **1958.** 9 figs table, 13 refs., 6 eqs. **DWB, DLC**—The investigation on the relation between total lea weight and breast-height diameter is necessary to estimate the total transpiration. The method of estimating the total leaf weight of *Cryptomeria japonica* was discussed, and thi was found to be proportional to the square of the breast-height diameter. The relation between transpiration rate and the meteorological elements regarding to this species were also investigated, and the empirical formulas necessary to estimate the total transpiratio were obtained. Finally, a stand of 740 *Cryptomeria japonica* (4376 sq m; about 1.1 ac) 4 years old was selected, for example, and the total leaf weight was estimated at 69 tons an the total transpiration at 1.80 ton/hour in case of air temperature, 26.6°C; relative humidity 80%; wind velocity, 3.5 m/sec; and radiation intensity, 1 cal/cm² min. This value was com pared with the water loss from various types of surfaces to show no serious error exists in ou estimation. The relationships between leaf temperature and transpiration rate and meteoro logical elements were also investigated. *Subject Headings:* **1. Transpiration of forests 2. Lea weight 3. Transpiration-meteorological elements relationships.**—*Author's abstract.*

10.2–100 551.5:614.8

Yamada, S.; Ōtsubo, T.; Danjō, T. and Shirono, T., **On the standards in the issue o fire warnings.** *Journal of Meteorological Research,* Tokyo, 8(5):313–319, June **1956.** 8 figs In Japanese. English summary p. 313. **DWB, DLC**—In general, fire warnings are issue when the effective humidity, minimum relative humidity, and maximum wind velocity hav exceeded certain fixed values. In this paper, the authors attempted to derive an index o the rate of fire danger. From an analysis of the relationships between the number of fire and the said meteorological elements, empirical formulas are constructed, and from combinatio of these formulas the index of the rate of danger is derived. *Subject Heading:* **1. Fire dange rating.**—*Authors' abstract.*

INDUSTRIAL METEOROLOGY

See also: **Solar radiation-air conditioning manuals, Calcutta** (Groundwater), 10.2–24; **Bibliog. on natural sources of energy,** 10.2–27.

10.2–101 551.524.36:69

Crow, Loren W. (*Consulting Meteorologist, Denver, Colo.*), **Using "climatic odds" to estima fuel oil requirements.** *National Conference on Applied Meteorology, Hartford, Conn., Oct. 195 Proceedings,* issued **1957.** Section B:8–15. 3 tables, fig. **DWB** (M A512pro)—Using onl past temperature records as reference material, one can gain some useful information regardin the probabilities of a given number of degree-days occurring in some future period. The fu oil requirements for a particular market area are very closely related to the degree-days and very stable use-per-degree-day factor can be established from careful analysis of past record

Examples are presented which illustrate the method of combining climatic ranges of degree-days and the use factor to determine the "climatic odds" of specific future fuel oil requirements. *Subject Headings:* **1. Degree-day data 2. Fuel requirements.**—*Author's abstract.*

10.2–102 551.556.3:621.311.24

Ledács-Kiss, Aladár, **A szélenergia nagyüzemi hasznosítása.** [Industrial utilization of wind energy.] *Magyar Energiagazdaság*, Budapest, 9(4):127–132, April **1956.** 9 figs. **DLC**—The use of high power-output wind generators was tried in two instances (Balaklava, Crimea, 1931–1941 and Grandpa's Knob, Vermont, 1941–1943); experiments are being conducted in the U.S.S.R., England, France and Germany. Construction problems of such powerful units (with outputs up to 10,000 kw) are discussed. Several existing or planned models, including one designed by the author, are described and illustrated. A diagram of wind conditions on Kékes Mt., Hungary, is presented, comprising curves of 1) annual frequency of wind speeds up to 20 m/sec, 2) corresponding specific energies and 3) annual useful energies. *Subject Headings:* **1. Wind utilization 2. Wind generators.**—*G.T.*

10.2–103 551.524.36 551.586:612.014.4

*Thom, E. C. (*Office of Climatology, U. S. W. B., Wash., D. C.*), **Cooling degree days.** *U. S. Weather Bureau, Weekly Weather and Crop Bulletin*, Wash., D. C., 44(12):7–8, March 25, **1957.** 3 figs., table. **DWB**—Three figures are given showing the average human discomfort index and the total cooling degree days in the U. S. during July 1956. The southeastern and southwestern states had the highest rise in temperature, reaching 89° in some areas. A chart is also given showing the various stations for which the cooling degree days were computed. *Subject Headings:* **1. Cooling degree days 2. Discomfort index 3. United States.**—*N.N.*

10.2–104 551.556:533.17:628.8

Reed, Robert H. (*Texas Eng. Exper. Sta.*), **Design for natural ventilation in hot-humid weather.** *National Research Council, Wash., D. C., Building Research Advisory Board, Housing and Building in Hot-humid and Hot-dry Climates, Nov. 18–19, 1952, Proceedings*, **1953.** p. 47–57. figs., 9 refs. **DWB**—The physics of air flow is analyzed in terms of pressure and temperature differences. The various types of air flow patterns are examined and they are shown as a function of the location and type of inlets and outlets. The role of geometric variables in architecture and overhang in inlet arrangements and landscape features in influencing air flow within buildings is considered. The various aspects of air flow discussed are illustrated by numerous diagrams. *Subject Headings:* **1. Air flow characteristics 2. Heating and ventilating 3. Architecture.**—*I.L.D.*

10.2–105 551.521.1:621.47

De Bremaecker, J.-Cl. (*Lamont Geological Obs., N. Y.*), **Chauffe-eaux solaires.** [Solar water heaters.] *Belgium. Académie Royal des Sciences Coloniales, Bulletin des Séances*, (3):462–476, **1956.** 3 figs., 4 tables, 4 refs., 6 eqs. **DWB**—Data (solar radiation, etc.) used in calculating solar energy available for a hot water heater, and other factors, are given and examples cited, economics worked out in comparison with electric heating costs, nomograms presented for calculation, collectors described and application to conditions in the Congo emphasized. Reference is made to equipment devised in U. S. *Subject Heading:* **1. Solar water heaters.**—*M.R.*

MEDICAL METEOROLOGY

10.2–106 551.508.2:551.586:612.5:536.51

Breckenridge, John R., **A portable, direct-reading thermistor thermometer for measuring rectal temperature.** *U. S. Quartermaster Research and Engineering Center. Environmental Protection Research Div., Technical Report*, EP-89, May **1958.** 16 p. 7 figs., 12 refs. **DWB** (M86 U585t)—A highly portable, direct-reading system for the accurate measurement of rectal temperature on physically active subjects is described. The system utilizes (1) a rugged molded rubber catheter containing a thermistor sensing element and (2) a simple indicator with a range of 95° to 105°F designed around a d-c measuring bridge circuit. Neces-

sary circuit details are given for the indicator, both when used separately and as an external unit for driving single- and multipoint recorders. The allowable tolerances for the various components consistent with a measurement accuracy of ±0.1°F are established and the importance of other sources of error is analyzed. *Subject Headings:* **1. Rectal thermometers 2. Rectal temperature measurement of physically active subjects.**—*Author's abstract.*

10.2–107 551.586:615.834

Trauner, L. and Goldberg, J. (*Zagreb*), **Vorschlag zur klimatischen Bewertung von Kurorten.** [A suggestion for the climatic evaluation of health resorts.] *Wetter und Leben*, Vienna, 7(8/11):276–277, **1955. DLC**—The various climatic criteria to be considered in evaluating health resorts are tested, and the classification of health resorts on the basis of climatic characteristics, facilities, medical services, states of health for which resort is suitable and local conditions. *Subject Headings:* **1. Resort climatology 2. Health resorts.**—*I.L.D.*

10.2–108 551.586:612.014.4

Berg, Hellmut, **Zur Bedeutung von Temperaturen und Feuchtigkeit für die Behaglichkeit.** [Importance of temperature and humidity for comfort.] *Wetter und Leben*, Vienna, 9(3/5):47–50, **1957.** 2 figs. **DLC**—During a 1½ month stay (June–July 1956) at Ben Gardane, Tunisia (approx. 31°N–11.2°E), measurements of temperature and relative humidity were made and simultaneous subjective sensations of cool, pleasant, warm and sweating were rated. The subjective sensations referred to an individual engaged in desk work dressed in light clothing and working in a shady, well ventilated room. An analysis of the data shows that there exists a transition region between the sensation of "pleasant" and the beginning of sweating in that either sensation may be felt on some days. With regard to the beginning and end of sweating a region is found in which sweating begins earliest above 50% RH when the temperature rises above 23.5°C, at 30% RH when the temperature is above 26°C and at 20% when it is above 29°C. Sweating is certain to occur at 70% RH when the temperature is above 27°C. At 50% RH this sweating threshhold is 29°C and at 30% RH it is approximately 35°C. Also the boundaries between "pleasant" and beginning of sweating are not lines for constant effective temperatures. *Subject Headings:* **1. Comfort zones 2. Sweating.**—*I.L.D.*

10.2–109 616.988.23:551.586

Martini, Rudolf, **Wetterabhängigkeit von Kinderlähmungsepidemien.** [Weather dependence of poliomyelitis epidemics.] *Umschau*, 57(16):490–491, Aug. 15, **1957.** 4 figs., 3 refs. **DLC**—Time relation between high atmospheric humidity and polio infection put forward by C. Armstrong is examined. In N. Rhine-Westphalia there was a sudden rise of polio cases on July 10, 1952, following a rise of temperature and maximum humidity on June 30. Closer investigation showed that every vapor pressure maximum of 25 mm over 5 days is followed 11–14 days later by a polio maximum. The incubation time of poliomyelitis is 12 days. Other elements showed no relation but fronts were effective with a lag of a few hours to 2–3 days. *Subject Headings:* **1. Poliomyelitis 2. Weather effects on poliomyelitis 3. Germany.**—*C.E.P.B.*

RADIOASTRONOMY

10.2–110 551.521.16:523.74

Hagen, J. P. (*Naval Res. Lab., Wash., D. C.*), **Radial brightness distribution of the sun at 8 mm.** (In: **Solar eclipses and the ionosphere: a symposium . . .** ed. by W. J. G. Beynon and G. M. Brown. London, Pergamon, **1956.** p. 253–257. 5 figs.) **DWB**—The principal solar radiation in the centimetre and millimetre regions comes from the chromosphere, and measurements of the variation in flux at these wavelengths during the course of an eclipse may be used to give a model of the solar atmosphere. Measurements of distribution of radio brightness at 8 mm made in Sweden during the 1954 eclipse show limb-brightening and a marked amount of brightness at the centre of the disk, which may be explained in terms of a two-fluid theory of the chromosphere: cool, dense spicules extending into a hotter, sparser gas of the lower corona. *Subject Headings:* **1. Radio brightness distribution 2. Eclipse observation of chromosphere.**—*Author's abstract.*

10.2–111 621.396:523.3:551.521.66

Kerr, F. J. and Shain, C. A.; Kraus, John D., **Reflexion of radio waves from the moon.** *Nature*, London, 179(4556):433, Feb. 23, **1957.** 2 refs. **DWB**—Kerr and Shain found reflection of 14 m waves from moon of level to be expected from a nonabsorbing isotropic moon; there is no evidence of the specular reflection postulated by Kraus. Kraus suggests that reflection was from a cloud of charged particles temporarily associated with the moon. *Subject Heading:* **1. Radio wave reflection from moon.**—*C.E.P.B.*

10.2–112 523.8:621.396.8:551.521.66

Ellis, G. R. and Newstead, Gordon, **Discrete sources of cosmic radio noise at 18.3 and 10.5 Mc/s.** *Journal of Atmospheric and Terrestrial Physics*, 10(4):185–188, **1957.** 2 figs., table, 3 refs. **DWB**—Observations were made at Hobart, Tasmania, of 6 sources of cosmic radio noise on 18.3 and 10.5 Mc/s. Differences in low-frequency end of spectra suggest absorption of radiation during passage through the galaxy. *Subject Heading:* **1. Stellar radio radiation.**—*C.E.P.B.*

10.2–113 522.1:621.396.8:551.521.66

Head, A. K., **A new form for a giant radio telescope.** *Nature*, London, 179(4562):692–693, April 6, **1957.** 2 figs. **DWB**—For hydrogen line (1420 Mc/s) a parabolic reflector must not deviate from its theoretical shape by >1 in., and the dead weight makes this difficult. A new design is proposed consisting of a large fixed hemisphere and a small barrel shaped reflector. *Subject Heading:* **1. Radio telescopes.**—*C.E.P.B.*

COSMIC RAYS

See also: **Beryllium^{-10} in deep sea sediments** (Goel et al.), 10.2–67; **Cosmic ray variations** (Fenton et al.), **10.2–223.**

10.2–114 551.521.64 537.59:546.45:529:551.7

Arnold, James R. (*Dept. of Chemistry, Princeton Univ.*), **Beryllium-10 produced by cosmic rays.** *Science*, Wash., D. C., 124(3222):584–585, Sept. 28, **1956.** fig., table, 8 refs., eq. **OLC**—Cosmic ray collisions with N_2 and O_2 in the upper atmosphere produced 4 lasting nuclides (C^{14}, tritium, Be^7 and Be^{10}), 3 of which have been used in studies of time scales. The last (Be^{10}) has been isolated and found to be a β emitter with a $\frac{1}{2}$ life of 10^6 yrs, but is very rare as it is produced at about 0.004/cm² sec decay rate according to author's estimates. Red clay sediments in the deep sea (2 cores from the eastern Pacific) were analyzed for Be^{10} by method described in this article, and the results shown in a curve comparing observed activity with a synthetic Be^{10} standard. Assuming a sedimentation rate of 1 mm/1000 yrs, the cores are about 16^6 yrs in depth, giving as an average 0.03 disintegrations/sec cm². Be^{10} is suggested for use in age determinations. *Subject Headings:* **1. Beryllium-10 production by cosmic rays 2. Deep sea sediments 3. Geochronology.**—*M.R.*

10.2–115 551.521.64

Chang, W. Y.; Del Castillo, G. and Grodzins, Leon (*all, Purdue Univ., Lafayette, Ind.*), **Further results from the study of sea-level penetrating showers.** *Physical Review*, 89(2):408–411, Jan. 15, **1953.** 2 figs., 3 tables, foot-refs. **DWB**—Completing earlier studies, this paper reports on the rare occurrence of (1) the nonionizing link showers associated with penetrating showers and (2) the scattering of the penetrating shower particles. Both of these occurrences are presented in excellent photographs. Because of poor statistics and unknown momentum spectrum of the shower particles, little more is known than that sea level penetrating particles very probably are both mesons of some kind and protons. *Subject Headings:* **1. Cosmic ray showers 2. Sea level penetrating particles.**—*W.N.*

10.2–116 551.521.64

Chang, W. Y. (*Physics Dept., Purdue Univ., Lafayette, Ind.*), **Sea level mesons stopped in thin Pb and Al foils, Pt. 1, Possible emission of charged nuclear particles and related events.**

Pt. 2, Low energy (1–5 Mev) gamma rays. *Physical Review*, 95(5):1282–1293, Sept. 1, **1954.** 8 figs., 6 tables, refs. **DWB.** *Subject Headings:* **1. Sea level mesons 2. Cosmic radiation.**

10.2–117 551.521.64

Cranshaw, T. E.; de Beer, J.; Galbraith, W. and Porter, N. A. (*all, Atomic Energy Res. Establishment, Harwell*), **Observations $_{m}$n extensive air showers, Pt. 5, The size spectrum of showers containing $3\times10^{6}-3\times10^{8}$ particles.** *Philosophical Magazine*, London, Ser. 8, 3(28):377–383, April **1958.** 3 figs., 3 tables, 3 refs., 3 eqs. **DLC**—A lattice arrangement of G.M. counters has been used to measure the size spectrum of showers containing $3\times10^{6}-3\times10^{8}$ particles. In this region, a power law distribution is found,

$$J(\geq N)=9.5\times10^{-5}(10^{6}/N)^{1.88\pm0.15_{m}-2}\ \mathrm{hr^{-1}ster^{-1}}.$$

An independent method of measuring the number of particles in the showers gave good agreement with these figures. (For Pts. 1 and 2, *see* 8.11–183, Nov. 1957, *MAB.*) *Subject Headings:* **1. Cosmic ray showers 2. Cosmic ray spectrum.**—*Authors' abstract.*

10.2–118 551.521.64

Daion, M. I., **Spektr elektronov na vysote 3200 m nad urovnem moria.** [Electron spectrum at 3200 m above sea level.] *Zhurnal Eksperimental'noĭ i Teoreticheskoĭ Fiziki*, 33(5):1166–1174, Nov. **1957.** Trans. into English by I. Emin in *Soviet Physics JETP*, N. Y., 6(5):897–902, May **1958.** 4 figs., 6 tables, 19 refs. **DLC**—Using a magnetic spectrometer in conjunction with a multiplate cloud chamber, a momentum spectrum was obtained for cosmic-radiation electrons in the range from 4×10^{8} to 4×10^{9} ev/c. The penetrating power of fast electrons ($E\geq4\times10^{8}$ ev) is discussed. *Subject Heading:* **1. Cosmic ray electron spectrum.**—*Trans. of author's abstract.*

10.2–119 551.521.64

Dovzhenko, O. I.; Nelepo, B. A. and Nikolskiĭ, S. I., **Energeticheskiĭ spektr μ-mezonov v shirokikh atmosfernykh livniakh kosmicheskikh lucheĭ.** [Energy spectrum of μ-mesons in extensive atmospheric cosmic ray showers.] *Zhurnal Eksperimental'noĭ i Teoreticheskoĭ Fiziki*, 32(3):463–466, March **1957.** Trans. by H. Kruglak in *Soviet Physics JETP*, N. Y., 5(3):391–393, Oct. **1957.** 2 figs., 2 tables, 5 refs. **DLC**—The energy spectrum of μ-mesons in extensive atmospheric showers of varying primary energy was studied in the energy range from 0.3 to 3.5 Bev. The measurements were carried out at mountain altitudes. It was found that in the aforementioned energy range the energy spectrum of μ-mesons is independent of the energy of the primary particle which initiated the shower. The mean μ-meson energy decreases with the distance from the shower axis. *Subject Headings:* **1. Cosmic ray showers 2. Cosmic ray spectrum 3. Cosmic ray μ-mesons.**—*Trans. of authors' abstract.*

10.2–120 551.521.64

†El-Mofty, Osman and El-Nadi, Mohamed (*both, Univ. of Cairo, Giza, Egypt*), **Multiple meson production theories applied to cosmic-ray showers.** *Physical Review*, N. Y., 99(3):921–925, Aug. 1, **1955.** 5 figs., 2 tables, 19 refs., 10 eqs. **DLC**—The multiple production theories are discussed from the point of view of multiplicity of produced mesons, and of their angular and radial distributions. Assuming that each π^{0} meson produces a shower core, these theories are applied to the analysis of previous experiments on the structure of cosmic-ray showers. The analysis favors FERMI's theory with high anisotropy of angular distribution, and it was found necessary to assume that only a small fraction of the energy in the original collision goes into the meson production. *Subject Headings:* **1. Cosmic ray theories 2. Fermi theory.**—*Authors' abstract.*

10.2–121 551.521.64

Guzhavin, V. V. and Zatsepin, G. T., **Altitude dependence of broad atmospheric showers according to the various models of the elementary act of nuclear collisions.** *Soviet Physics JETP*, New York, 5(2):312–313, Sept. **1957.** Translated by R. T. Beyer from the original Russian in *Zhurnal Eksperimental'noĭ i Teoreticheskoĭ Fiziki*, 32(2):365–366, Feb. **1957.** tables, 5 refs. **DLC**—Calculations of the development in the atmosphere of nuclear-active and

lectron-photon components from primary protons of three different energies (10^{14}, 10^{16}, 10^{18} ev) were carried out for two variants of nuclear collision models. In both variants, the ree path in air of the nucleons and pions was taken to be independent of the energy, and equal o 65 gm/cm^3, which corresponds to the geometric cross section of the nuclei of the atoms of he air. The results of the calculations of the altitude dependence depend slightly on the nergy spectra of the created mesons, but are very sensitive to the amount of energy remaining ith the nucleon; therefore the results present a weighty argument that in the region $E>5\times10^{12}$ v (at least up to $E=10^{14}-10^{16}$ ev) the nucleon in collisions with nuclei of the atoms of the ir loses, on the average, only about $\frac{1}{3}$ of its energy. Conversely, for the region of very high nergies ($E=10^{18}$ ev), it is concluded that a significant breaking down in the energy of the ucleon takes place in nuclear collisions. *Subject Headings:* **1. Cosmic ray showers 8. Cosmic ay production energy.**—*Authors' abstract, R.P.*

10.2–122 551.521.64

Lüst, Reimar; Schlüter, Arnulf and Katterbach, Klaus (*all, Max-Planck-Inst. für Physik, Göttingen*), **Die Bahnen von Teilchen der kosmischen Strahlung im Erdmagnetfeld.** [The aths of cosmic-ray particles in the geomagnetic field.] *Akademie der Wissenschaften in Göttingen. Mathematisch-Physikalische Klasse, Abt. IIa, Nachrichten*, No. 8:127–222, **1955.** ables, figs., 9 refs., 82 eqs. **DLC**—Störmer's (1936) basic equations for computing cosmic ay paths in a magnetic field, and the numerical integration of these equations are discussed, s well as the programming for the Göttingen electronic computers G1 (1000 instructions) and G2 (1800 instructions). 400 cosmic ray paths were calculated by means of these computers or various energies and angles of incidence. Results are tabulated. Forbidden areas, zero aths, points of incidence, intensity distribution, absorption cross sections, and special paths re graphically presented. *Subject Headings:* **1. Cosmic ray paths 2. Cosmic ray computers.** —*G.T.*

METEOROLOGICAL OBSERVATIONS AND INSTRUMENTS

METHODS OF OBSERVATION

See also: **Hurricane spiral bands** (Senn et al.), 10.2–26; **Observers training manuals,** 10.2–32; **Arctic research projects, Thule,** 10.2–41; **Auroral observation, Antarctica** (Gartlein), 10.2–49; **Radioactivity monitoring networks, U. S.** (List), 10.2–181; **Geopotential height** (Slobodov), 10.2–187; **Aurora australis, Christchurch, New Zealand and Australia** (Seed, Ellyett), 10.2–341.

10.2–123 551.501:551.508.762:551.578.11

*Blanchard, D. C. and Spencer, A. T. (*both, Woods Hole Oceanog. Inst., Mass.*), **Raindrop easurements during Project Shower.** *Tellus*, Stockholm, 9(4):541–552, Nov. **1957.** 3 figs., tables, 4 refs. **DWB**—Raindrop size distributions have been obtained on the island of Hawaii with filter papers and with a device called a drop recorder. The drop recorder auto- natically exposes a section of dyed paper tape to the rain at approximately two-minute ntervals. The maximum sized drop found on each of the more than 4000 samples has been lotted as a function of time. It is shown that a fair correlation exists between the maximum ized drop and rain intensity. Over 300,000 drops $m^{-3}<0.2$ mm diameter have been found n very light rains at altitudes of 5500 ft on the volcanoes of Mauna Kea and Mauna Loa. *Subject Headings:* **1. Project Shower, Oct.–Dec. 1954 2. Raindrop size measurement 3. Ha- aii.**—*Authors' abstract.*

10.2–124 551.501:551.577.51

Tollner, Hanns (*Salzburg*), **Zur Niederschlagsmessung in den Alpen.** [Precipitation easurement in the Alps.] *Wetter und Leben*, Vienna, 8(8/11):173–180, **1956.** 17 refs. **DLC**—In mountains the measurement of rainfall is rendered complicated by increasing wind ffect, increasing proportion of snow in the total precipitation, the finer structure of the pre- ipitation particles and, above all, by the differently inclined slopes and exposures. The uthor discusses the efficiency of the use of totalizers, shielded rain gages with horizontal

openings, the use of water balance, the difficulties of measuring rainfall in firn surfaces and glaciers, etc. *Subject Headings:* **1. Precipitation measurement techniques 2. Orographic rainfall 3. Alps.**—*I.L.D.*

10.2–125 551.501:551.577

†Bruce, J. P. and Potter, J. G. (*both, Climatological Div., Met. Br., Toronto*), **The accuracy of precipitation measurements.** *Royal Meteorological Society, Canadian Branch, [Publication]*, 8(1):1–15, **1957.** fig., 3 tables, 23 refs. **DWB, DLC**—The history of studies on the reliability of precipitation measurements such as the effect of turbulence around the orifice, catch deficiencies at various wind speeds, etc. are reviewed. Local sources of error have been shown to be nearly all negative with a cumulative rather than compensating effect upon precipitation totals. Areal errors, however, are compensating over a period of time. The present uses of precipitation figures (water supply, flood forecasting, etc.) and ways of satisfying the needs for more precise precipitation data (greater rain gage network, more rainfall intensity measurements, better siting, etc.), as illustrated by the work of the Conservation Branch of the Ontario Department of Planning and Development, are discussed. The principles underlying the selection of precipitation gages, the problem of making exact measurements of snow fall, the accuracy of the conversion of snow fall depth into water equivalent, etc. are discussed. A graph illustrating the general relation of precipitation catch to wind speed, and tables showing a comparison of international standard gages, etc. are presented. *Subject Heading:* **1. Precipitation measurement.**—*I.L.D.*

10.2–126 551.501.45:551.577.21

Franceschini, Guy A. (*Dept. of Oceanog. and Met., A & M College of Texas*), **A method for determining the average precipitation between curved isohyets.** *American Geophysical Union, Transactions*, 39(2):273–277, April **1958.** 3 figs., table, ref., 11 eqs. **DWB, DLC**—A method is presented to enable the hydrologist to make more accurate computations, based on the isohyetal method, of precipitation volume over an area. Essentially, the method is concerned with determining the average precipitation value in areas between curved isohyets. The technique is developed for circular concentric isohyets but is extended to other cases. An overlay-nomogram is utilized for the computations. *Subject Headings:* **1. Precipitation calculations 2. Isohyetal charts 3. Curved isohyets.**—*Author's abstract.*

10.2–127 551.501.5:551.571.2

Nakarenko, N. F., **Karty udel'noĭ vlazhnosti severnogo polushariia.** [Charts of specific humidity in the Northern Hemisphere.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, 70:60–91, **1957.** 12 figs., 7 tables. **DLC**—The author introduces 12 of 36 monthly charts (three for each representative month of a season—Jan., April, July and Oct.) constructed by him for 3, 4 and 5 km heights based on specific humidity data from foreign sources, and data from the Central Scientific Research Hydro meteorological archives. Detailed information on the method used for constructing the charts, and a discussion of the results are presented. The author admits that the charts provide only an approximate idea of the distribution of specific humidity at certain selected heights. Extensive tables give latitudinal values of humidity at 5° intervals (10°–70°N) for East Asia, Western America, Pacific Ocean, Eastern America, Western Europe and Africa, Atlantic Ocean, East Europe and Eurasia for each month and the 3 levels, and also for 10° intervals of latitude and longitude. *Subject Headings:* **1. Specific humidity world data 2. Northern Hemisphere humidity charts 2. Upper air humidity charts.**—*A.M.P.*

10.2–128 551.501.7:551.507.321.2

Sinha, K. L. (*Gauhati Aerodrome, Assam, India*), **A method of working out the rate of ascent of the balloon from the value of the coefficient of aerodynamic resistance.** *Beiträge zur Physik der Atmosphäre*, Frankfurt a.M., 30(4):297–303, **1958.** 2 tables, 18 refs., 9 eqs. German, English and French summaries p. 297–298. **DLC**—The author derives as expression for the uniform ascent of a balloon the formula

$$V^2 = \frac{F \cdot g}{\rho d^2 \cdot f(N)},$$

here V is the uniform vertical velocity of the balloon, F the buoyancy, g the acceleration of gravity, ρ the air density, d the balloon diameter, v the kinematic viscosity coefficient and here f, a function of the Reynolds number $N = V \cdot d/v$, is the aerodynamic resistance coefficient enerally represented by K. When the Reynolds N number along the balloon trajectory is rger than a certain limiting value, the aerodynamic resistance coefficient $f(N)$ is constant nd the above formula can be applied directly with the constant value of $f(N)$ without first nding V. But if the Reynolds number N is less than this limiting value, the value of V- aries with N, and the above formula can not be applied to compute V without knowing N, hich in its turn depends on V. With parameters which are either known or can be com- uted, one can show that $KN^2 = Fg/\rho v^2$ and thus is independent of V. Then one can derive ne corresponding value of N. For this, one draws with the aid of experimental values of K btained for different N's, the curve representing the variation of KN^2 as function of N. Once ne appropriate Reynolds number is determined, one finds V from the formula $N = V \cdot d/v$, r with the aid of the corresponding value of the coefficient of aerodynamic resistance and the bove formula. The values of V have been calculated with this method for balloons of the ype used as pilot balloons. These values have been compared with the corresponding values btained by the empirical formula generally used to find the uniform ascent rate of pilot- alloons. Both methods are in good agreement. *Subject Headings:* **1. Balloon ascension ates 2. Aerodynamic properties of balloons 3. Drag coefficient of balloons.**—*Author's bstract.*

OBSERVATIONAL DATA

See also: **Climate of Northice, Greenland** (Hamilton), 10.2–40; **Glacier-met. expeditions, Langjökull Glacier, Iceland** (Hannell and Ashwell), 10.2–43; **Australian Antarctic Research Expeditions** (Law, Bechervaise), 10.2–45; **Antarctic expeditions, Mirny, Antarctica** (Khvat), 10.2–46; **Auroral observation in Antarctica** (Gartlein), 10.2–49; **British participation in IGY,** 10.2–50; **IGY and education** (Michelson), 10.2–51; **British participation in IGY** (Deacon), 10.2–52; **Project Vanguard** (Strong), 10.2–74; **Seasonal weather changes, Japan** (Asakura), 10.2–202.

10.2–129 551.506:551.553.21(54)

Weather-monsoon season, June–September 1955. *Indian Journal of Meteorology and Geophysics*, Delhi, 7(1):67–73, Jan. **1956.** 2 figs. **DWB, DLC**—A long month by month escription of weather in India from June to Sept. 1955 is included with a rainfall chart and ionthly histograms for 27 areas of India. July was dry but Aug.–Oct. unusually wet, so the eason turned out wet (11% excess), and unprecedented floods occurred in Orissa and the unjab. Other floods occurred in June. The monsoon lasted unusually late into Oct. *Subject Headings:* **1. Monsoon season weather summaries 2. India.**—*M.R.*

10.2–130 551.506.7(969):551.508.822

*Amman, E. (*U. S. W. B., Honolulu*), **Upper air data for Project Shower.** *Tellus*, Stockolm, 9(4):569–580, Nov. **1957.** mostly tables. **DWB**—Daily upper (rawinsonde) air ressure, temp., mixing ratio and wind data are presented for levels from surface to 10,000 ft or Oct. 13–Dec. 6, 1954 for Hilo Airport. In a few cases, when the stable layer extended igher (because of a higher trade inversion), the flights were extended to 11,000 or even 12 r 13,000 ft so as to include all of the moist layer. *Subject Headings:* **1. Upper air data during roject Shower 2. Project Shower, Oct.–Dec. 1954 3. Rawinsonde data 4. Hilo Airport, awaii.**—*M.R.*

10.2–131 551.506.7(969):551.557

*Eber, Laurence E., **Upper air and surface wind observations.** *Tellus*, Stockholm, 9(4): 58–568, Nov. **1957.** 4 figs., 6 tables. **DWB**—Upper air and surface wind observations were ade with a mobile unit on the Hilo coast and at 6 stations on a line on the slopes of Mauna oa and Mauna Kea on Hawaii during Project Shower, Oct. 20–Dec. 4, 1954. Data are resented in extensive tables and analyzed graphically (surface winds every 4-hrs at Saddle oad Stations at 2100 ft, 4500 ft and C77, at Keaau Orchard, Kulani Camp and at Hilo Air- ort). Diurnal variations in wind speed are shown on graphs for the several stations; a

downslope wind occurring at night and an upslope wind during the day (with a maximum a noon). The transition occurs earlier in the a.m. at 5000 ft than at lower elevations. *Subject Headings:* **1. Upper air wind data 2. Mobile unit wind data 3. Project Shower, Oct.–Dec 1954 4. Hilo Airport, Hawaii 5. Mauna Loa, Hawaii.**—*M.R.*

INSTRUMENT CARRIERS

See also: **Project Vanguard** (Strong), 10.2–74; **Atmospheric drag effect on satellite** (Sedgwick), 10.2–75; **Satellite observatories,** 10.2–76; **Aerodynamic properties of balloons** (Sinha), 10.2–128; **Radio fading** (Rogers), 10.2–178; **Adiabatic temp. changes** (Guterman), 10.2–188; **Pressure data discrepancies between American and Russian observations** (Ripley), 10.2–239.

10.2–132 523.75:551.507.362.

High-altitude studies of solar flares. *Science*, Wash., D. C., 124(3214):213–214, Aug. 3 **1956. DLC**—The program for instantaneous electronic triggering or release of balloon-borne rockets for measuring radiations from solar flares, planned by the Naval Research Laboratory is described. The balloons were to be released from the U.S.S. "Colonial," 200–400 mi wes of San Diego, Calif. during the last 2 weeks of July 1956. Ten 12-ft "Deacon" rockets release from Skyhook balloons 68 ft in diameter at 80,000 ft would carry 20 lbs of instruments (photo counters sensitive in ranges of .05–1, and 1–10Å, and at 1216Å) each, with a time-lag of 90–12 sec for release and would decrease the delays encountered in past attempts at solar flare spectros copy from conventional rockets at high levels. *Subject Headings:* **1. Solar flare observation from rockets 2. Balloon-borne rockets 3. "Deacon" rockets 4. Photon counters.**—*M.R.*

10.2–133 551.507.362.1:551.594.12:551.508.9

Spencer, N. W. and Boggess, R. L., **On the use of ionization-gage devices at very hig altitudes.** Michigan. Univ. Engineering Research Institute, Contract AF 19(604)-1890 Final Report, Jan. **1958.** 16 p. 2 figs., table, 16 refs., eqs. **DWB** (M94.12 M624on)—The use of an ionization-gage—omegatron combination in rockets and satellites at very hig altitudes is considered. Appropriate instrumentation employing these devices is believed t offer good possibilities for the measurement of atmospheric pressure, temperature, density and composition. *Subject Headings:* **1. Ionization measurement by rockets 2. Rocke instrumentation.**—*Authors' abstract.*

INSTRUMENTS

See also: **Radio meteorology** (Marshall, Gordon), 10.2–18; **Instrument conferences, U.S.S.R.,** 10.2–58; **Device for thunderstorm avoidance** (Vonnegut et al.), 10.2–85; **Upper air data, Project Shower** (Amman), 10.2–130; **Ionization measurement by rockets** (Spencer, Boggess), 10.2–133; **Precipitable water measurement** (Vassy, A. and E.), 10.2–258; **Potential gradient measurements, Poona** (Venkiteshwaran, Huddar), 10.2–335; **Whistling atmospherics and sferics** (Delloue), 10.2–343.

10.2–134 551.508.49:629.13.05

Lin, Shih-nge (*Inst. of Aeronautics, Peking*), **The design and testing of barometric typ absolute altimeter with atmospheric temperature correction mechanism.** *Scientia Sinica* Peking, 7(1):121–130, Jan. **1958.** 3 figs., 3 tables, 4 refs., 6 eqs. Original version in: *Institut of Aeronautics, Peking, Journal*, 2(2):38–51, **1957. DWB**—Barometric type altimeters which are widely used on modern airplanes cannot accurately indicate absolute altitudes of airplane above sea level because of the error introduced directly by fluctuations of atmospheric tem peratures. The present paper discusses theoretically the possibility of introducing atmospheri temperature correcting mechanism into the ordinary altimeter to compensate for the error du to atmospheric temperature variations so that the altimeter can indicate absolute altitud directly. In accordance with theoretical discussions, there is also presented a typical desig for the barometric type absolute altimeter. Actual construction of the instrument and th experimental results obtained in the laboratory as well as in flight testing on airplane sho that it is possible to design barometric type altimeters indicating absolute altitudes directl

ithin allowable scale error for ordinary barometric altimeters. *Subject Headings:* **1. Baro-etric type altimeters 2. Altimeter corrections.**—*Author's abstract.*

10.2–135 551.501.9:551.508.5

Sanuki, M. (*Japan Met. Agency*) and Tsuda, N. (*Meteorological Res. Inst.*), **What are we easuring on the top of a tower?** *Papers in Meteorology and Geophysics*, Tokyo, 8(1):98–101, pril **1957.** 3 figs. (incl. photos), ref., eqs. **DWB**—To visualize the velocity distribution f the flow over an anemometer tower, tank test is conducted for cylinders resting on a flat lane, thus representing the actual arrangement. It is concluded from the results that the sual installation is far from satisfactory, causing serious errors at times. A remedy is proposed nd tested. It is also suitable to weather stations suffering from snow deposit on the ane-ometer. *Subject Heading:* **1. Anemometer exposure.**—*Authors' abstract.*

10.2–136 551.508.53

Taylor, R. J. (*Div. of Met. Physics, Commonwealth Scientific and Industrial Res. Org., Melbourne*), **A linear, unidirectional anemometer of rapid response.** *Journal of Scientific Instruments*, London, 35(2):47–52, Feb. **1958.** 8 figs., table, 2 refs., 7 eqs. **DLC, DWB**—A eated wire dissipating constant power causes temperature changes in the air moving past it hich vary approximately inversely as the wind speed. These temperature changes are etected by a thermometric bridge and, by means of a circuit with feedback control, an electrical ignal is constructed which is linearly related to the velocity. The resulting anemometer is ensitive only to the normal velocity component and, by combining two such anemometers, hanges in sign of this component can be accommodated. Four fine wires (0.0005 in. tungsten r nickel) are used but they can be replaced if damaged without affecting the calibration. The ime constant of the instrument is about 0.3 s at a wind speed of 0.5 ms^{-1} and decreases some-hat at higher speeds. *Subject Heading:* **1. Anemometers.**—*Author's abstract.*

10.2–137 533.607 551.508.54

Comte-Bellot, Geneviève and Mathieu, Jean, **Soufflerie pour étude des anémomètres fil chaud utilisés en turbulence.** [Wind tunnel for the study of hot wire anemometers used n turbulence.] *Académie des Sciences, Paris, Comptes Rendus*, 246(15):2220–2221; April 14, **958.** 1 fig., 2 refs. **DLC**—A wind tunnel provides an air spray, the average speed and verage temperature of which are homogeneous and adjustable; screens are introduced at ill and create a kinematic or thermic turbulence. Dust is efficiently eliminated by means of aper filters. A diagram shows the aerodynamic circuit and the essential parts of the wind unnel. *Subject Headings:* **1. Wind tunnels 2. Hot wire anemometers.**—*A. V.*

10.2–138 551.508.54

Cowdrey, C. F. (*Natl. Physical Lab., Teddington, Eng.*), **Temperature and pressure orrections to be applied to the shielded hot wire anemometer at speeds for which natural onvective cooling is negligible.** *British Journal of Applied Physics*, London, 9(3):112–116, March **1958.** 5 figs., 4 refs., eqs. **DLC**—The form of the law of cooling of a shielded hot ire anemometer should not differ greatly from the normal laws of cooling of heated cylinders. By using the law propounded by HILPERT, a method is devised to allow for changes in ambient emperature and pressure when a hot wire anemometer is used at speeds for which the cooling an be considered as entirely due to forced convection. This method is then used to derive he corrections needed in the measurement of air flow over the range of variation of atmospheric onditions normally experienced. However, with slight modifications to allow for changes n the values of the physical constants, it should be possible to use the general method to cover ll "perfect" gases at various ambient conditions. A number of experimental results are ncluded in support of the theory. A simple circuit is indicated in the appendix, based on hat outlined by SIMMONS by which the useful range of the instrument is greatly increased. *Subject Heading:* **1. Hot wire anemometers.**—*Author's abstract.*

10.2–139 551.508.71

Bindon, H. H. (*Instrument Div., Met. Services of Canada*), **Humidity measuring instru-ents.** *Royal Meteorological Society, Canadian Branch, [Publications]*, 7(5), Nov. 29, **1956.**

11 p. 7 figs., 3 refs., eq. **DWB**—The instruments used to measure atmospheric humidity are surveyed and the theoretical and physical principles underlying the various measuremen methods and instruments are summarized. The author considers (1) the thermodynamic method including the theoretical empirical formulas for a wet and dry bulb psychrometer the theoretical formulation of the psychrometric constant by AUGUST and MAXWELL and experimental determination of ventilation limits; 2) the hygroscopic method involving the change of length of some material; 3) absorption methods involving a change in electrical resistance of the material which may be used as humidity sensors; these sensors are con ductivity of aqueous electrolytic solutions, surface resistivity of impervious solids, resistivity of dimensionally variable materials and the temperature of saturated salt solutions; 4) tem perature controlled saturated solutions; 5) dew point or condensation method; and 6) variou optical methods such as the infrared absorption hygrometer. A diagram of a remote readin psychrometer is presented. *Subject Heading:* **1. Humidity instruments.**—*I.L.D.*

10.2–140 551.508.7

Puzanov, V. P., **K teorii psikhrometra.** [Psychrometric theory.] *Moscow. Universitet Uchenye Zapiski*, No. 160:217–241, **1952.** 8 figs., 2 tables, 5 refs., 10 eqs. **DLC** (Q60.M868)— A theoretical and experimental treatment of the subject, showing that at present psychrometri theory is unable to present in a formula all the factors influencing the psychrometer. Th "August" psychrometer, used now in the Soviet meteorological network, can be as accurat as a psychrometer with constant aspiration as soon as the wind speed about the thermometer bulbs is established experimentally, and is indicated on the calibration record. *Subject Heading:* **1. Psychrometers.**—*A.M.P.*

10.2–141 551.508.71:551.57

Tanner, C. B. and Suomi, V. E. (*both, Dept. of Soils, Univ. of Wisconsin*), **A max-min dew-point hygrometer.** *American Geophysical Union, Transactions*, 39(1):63–66, Feb. **1958** 5 figs., 6 refs. **DWB, DLC**—The lithium chloride Dewcel, covered under Foxboro Company Patent 2,359,278, has been used in conjunction with a max-min thermometer calibrated directly in degrees dew point to provide maximum and minimum and current dew points The max-min feature of the hygrometer and the operation convenience make it a particularly suitable instrument for use at cooperative observer stations. A unique advantage of the lithium chloride Dewcel for a cooperating observer station is that the relative error of the measurement is the same at all dew points within the operating range. *Subject Headings* **1. Lithium chloride hygrometers 2. Dewcel 3. Max-min thermometers 4. Dew point gradient measurement techniques.**—*Authors' abstract.*

10.2–142 551.508.72:551.57

Taylor, R. J. and Dyer, A. J. (*both, Div. of Met. Physics, Commonwealth Sci. and Ind Res. Organ., Aspendale, Victoria, Australia*), **An instrument for measuring evaporation from natural surfaces.** *Nature*, London, 181(4606):408–409, Feb. 8, **1958.** 2 figs., 6 refs. **DWB DLC**—A description of an instrument which permits the automatic direct determination o natural evaporation by equating it to the vertical turbulent flux of water vapor in the layer of air near the ground. "The validity of this equation demands that there be no vertical transport of water vapor between the ground and the level of the instrument and that a measurement of turbulent flux made at a point be representative of the area." The turbulent flux of water vapor is given by the covariance between (1) the product of air density (ρ) and the vertical velocity component (ω) and (2) the specific humidity (q). The principle involved was first used by SWINBANK. The instrument provides continuous electrical signals pro portional to $\rho\omega$ and q, and performs the necessary mathematical operations of multiplication and integration automatically. The sensing devices are mounted 1.5 m above the ground and response times of about 0.3 sec are needed in the anemometer, hygrometer and multiplie in order to take into account contributions of flux made by the smallest eddies. The anemometer which is of a new design (*J. Scient. Inst.*, 35:47–52, Feb. **1958**) is linear. The hygrometer is based on fine wire, wet and dry bulb resistance thermometers designed by MCELROY (*Australian J. Agricul. Res.*, 6:196, **1955**). The integrators are of the electromagnetic type described by GILBERT (*Rev. Sci. Instr.*, 18:318, **1947**). A photo of the evaporimeter and

graph giving observed values of evaporation rate are presented. *Subject Headings:* **1. Evaporimeters 2. Evaporation measurement techniques.**—*I.L.D.*

SYNOPTIC ANALYSIS AND FORECASTING

See also: **Hydrodynamic short range forecasting** (Kibel'), 10.2–13; **Synoptic meteorology textbooks** (Khromov), 10.2–14; **Weather analysis, Falkland Is. Dependencies** (Mansfield, Glassey), 10.2–15; **Northern Hemisphere 500 mb charts** (Bryson et al.), 10.2–30; **Arctic anticyclonic circulation** (Fjørtoft), 10.2–37; **Numerical forecasting techniques** (Blinova, Kibel'), 10.2–150; **Radioactive fallout pattern forecasting** (Hsu), 10.2–179; **Vorticity equations** (Kubota), 10.2–186; **Frontolysis** (Bacinschi), 10.2–213; **Moisture exchange over continents, Western Siberia, U.S.S.R.** (Orlova), 10.2–257; special bibliography on **Tornado analysis and forecasting,** p. 270.

10.2–143 551.509.3

*Gringorten, Irving I.; Lund, Iver A. and Miller, Martin A., **Construction and use of forecast registers.** *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers,* No. 53, June **1956.** 131 p. 17+12 figs., charts, 79 tables, 15 refs., eqs. **DWB, DLC**—A "Forecast Register" is essentially a record of the past weather at a station specifically designed to provide a forecaster with a handy reference to past weather situations which closely resemble the current situation. It consists of many lines of coded information. Each line includes the date, a coded description of the situation on that date, and the subsequent weather developments. By properly arranging the information in the registers, coding the current situation, and then matching the current situation with the past cases, it is possible to select cases out of the past which are similar to the current case. The manner in which the weather developed in this sample of past cases will provide a good clue of what can be expected to follow the current situation. In many instances the forecaster may be alerted to unexpected developments. A register can shed no more light on subsequent weather than can be obtained from the predictors it contains. Much space, therefore, is devoted to the problem of selecting predictors and determining their association with various predictands. For their forecast value, the registers were trial tested at four detachments of the Air Weather Service. The results showed that forecasting can be improved by use of this aid; however, a general improvement at all stations was not realized. Aside from forecasting, the registers are demonstrably useful in preparing case studies and compiling climatic data. *Subject Headings:* **1. Forecast registers 2. Forecast aids 3. Forecast improvement 4. Weather forecasting 5. Climatic analysis.**—*Authors' abstract.*

10.2–144 551.509.31:551.542

*Shorr, Bernard, **Empirical orthogonal functions applied to prediction of the sea-level pressure field.** Massachusetts Institute of Technology. Dept. of Meteorology, Contract AF 19(604)-1566, Scientific Report, No. 3, Nov. **1957.** 88 p. 9 figs., tables, 14 refs., eqs. **DWB** (M09.3 M414s)—Empirical orthogonal functions are presented for the fields of sea-level pressure, pressure tendency, and temperature over a 64-station network covering the U. S. and southern Canada. These functions, individually and in combination, are examined as possible predictors of the field of sea-level pressure. A forecast scheme, based upon certain statistically-selected functions of the contemporary distributions of pressure and pressure tendency, is developed and tested. The scheme exhibits positive skill in predicting the general spacial distribution of the pressure centers but not their intensities. The statistical stability of the empirical orthogonal functions and of some of the derived forecast formulas suggests the possibility for further improvement in prediction. *Subject Headings:* **1. Empirical orthogonal functions 2. Pressure forecasting.**—*Author's abstract.*

10.2–145 551.509.311:551.515.13

Karelský, S. (*Central Office, Melbourne*), **Evaluation of upper air prognosis by Rossby method.** *Australian Meteorological Magazine,* Melbourne, No. 19:15–28, Dec. **1957.** fig., 9 refs., 7 eqs. **DWB, DLC**—An experiment on the application of ROSSBY's "long wave" formula to forecasting of 24 hrs displacements of troughs at the 500 mb level, has been made

for the Australian region. Rossby's simplifying assumptions and the theoretical basis of his method are discussed. Also some conclusions of U. S. meteorologists regarding the practical application of the formula are included in the article. It is found that the formula is of little practical value for the relatively limited area of the Southern Hemisphere covered by Australian upper level charts. *Subject Headings:* **1. Rossby regime 2. Waves in the westerlies 3. Trough displacement forecasting 4. Australia.**—*Author's abstract.*

10.2–146 551.509.313

Reed, Richard J. (*Univ. of Washington*), **A graphical prediction model incorporating a form of nonadiabatic heating.** *Journal of Meteorology*, 15(1):1–8, Feb. **1958.** 8 figs., 2 tables, 17 refs., 34 eqs. **DWB, DLC**—A two-level graphical prediction model is extended so as to include the effects of heating of cold air by relatively warm water. Orographic effects are also included in the model. The model is applied to a case of a major storm development in the Gulf of Alaska attended by a strong outbreak of Arctic air from the Alaskan mainland. In this case the effects of nonadiabatic heating and orography appeared to be significant and in a direction which tended to improve the forecast. *Subject Headings:* **1. Graphical forecasting models 2. Nonadiabatic heating 3. Orographic effects.**—*Author's abstract.*

10.2–147 551.509.313:551.43

Belousov, S. L. and Bykov, V. V., **Ob uchete vliianiia gor pri prognoze baricheskogo polia.** [Consideration of the effect of mountains in forecasting the baric field.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, 9:1142–1153, **1957.** 11 figs. (incl. fold. maps), 3 refs., 11 eqs. **DWB**—One of the possibilities of increasing the precision and effectiveness of forecasting for the mean level of the atmosphere by means of electronic calculators is to take into account vertical atmospheric motions, especially those produced by large mountain chains. The equation for forecasting the geopotential at mean atmospheric levels is derived, namely

$$\Delta q - \frac{\partial \ln \eta}{\partial x}\frac{\partial q}{\partial x} - \frac{\partial \ln \eta}{\partial y}\frac{\partial q}{\partial y} = \tilde{F}(x,y,\eta),$$

where

$$\tilde{F}(x,y,\eta) = -\frac{g}{l}\left(\tilde{H}, \frac{1}{\eta}\Delta\tilde{H} - \frac{1}{\eta^2}\frac{\partial \eta}{\partial x}\frac{\partial \tilde{H}}{\partial x} - \frac{1}{\eta^2}\frac{\partial \eta}{\partial y}\frac{\partial \tilde{H}}{\partial y}\right) - \beta\frac{\partial \tilde{H}}{\partial x} - \frac{l}{\eta}(\eta,\tilde{H}),$$

$$q = \frac{\partial \tilde{H}}{\partial t}.$$

The solution of this equation for a universal electronic computer is presented and its application to calculating the effect of the Scandinavian mountains and to 24-hr forecasting of high altitude charts is illustrated. *Subject Headings:* **1. Orographic effects on forecasting 2. Forecasting by barometric tendencies 3. Electronic computers.**—*I.L.D.*

10.2–148 551.509.313:551.588.2:551.547

Kawata, Y. (*Geophysical Inst., Tokyo Univ.*), **The influence of the Rocky Mountains on non-steady isobaric height patterns.** *Meteorological Society of Japan, Tokyo, Journal*, Ser. 2, 35(3):174–183, June **1957.** 19 figs., 11 refs., eqs. **DWB, DLC**—Concerning the influence of mountains on large scale isobaric height pattern, most of the investigators up to now discussed the subject under the assumption of steady state. But recently the problem of the influence of mountains on nonsteady height pattern has attracted much interest from investigators in this field, because the results of numerical weather prediction of the lower layer are not satisfactory in mountain regions. Therefore, we examined the influence of the Rocky Mountains in nonsteady state, by solving the vorticity equation numerically. We adopted typical model height patterns in middle latitudes as the initial conditions, and we compared the patterns obtained for the case, in which we take into account the effect of the mountains with those for the case in which we do not take it into account. *Subject Headings:* **1. Isobaric surfaces 2. Topographic influences 3. Rocky Mountains.**—*Author's abstract.*

10.2–149 551.509.313:551.511.33

Aubert, Eugene J. (*A. F. Cambridge Res. Center*), **On the release of latent heat as a factor in large scale atmospheric motions.** *Journal of Meteorology*, Boston, 14(6):527–542, Dec. **1957.** 13+figs., table, 5 refs.—A mathematical formulation is made of a quasi-geostrophic numerical weather prediction model which includes the heat released during the condensation process. One set of 12- and 24-hr predictions is presented and discussed. Included are predictions made with and without the release of latent heat. While predictions were made at six pressure surfaces, figures only include height of the 1000-, 500-, and 200-mb surfaces, the vertical motion at the 800-, 400-, and 200-mb surfaces, and precipitation during 6- and 24-hr periods. The forecasts are compared with the observed distributions and the differences in the forecast patterns due to the release of latent heat are discussed. It is concluded that the release of latent heat causes significant differences in the cyclone-scale pressure, vertical motion, and precipitation distributions during forecasts of one day. *Subject Headings:* **1. Large scale weather processes 2. Latent heat release 3. Numerical forecasting.**—*Author's abstract.*

10.2–150 551.509.313:551.509.33

§Blinova, E. N. and Kibel', I. A. (*both, Central Forecasting Inst., Moscow*), **Hydrodynamical methods of the short- and long-range weather forecasting in the USSR.** *Tellus*, Stockholm, 9(4):447–463, Nov. **1957.** 9 figs., 24 eqs. **DWB**—The KIBEL' model of short range numerical forecasting, used with some variations in the U.S.S.R. for the past 15 yrs, is given (by KIBEL') in some detail, and graphical methods derived therefrom described. Linearization methods for mid-tropospheric short range forecasting (KIBEL', 1950; MARCHUK, 1954 and NEMCHINOV, 1955) are similar to long range forecasting methods described in the second part of the paper. Use of computing machines for solving the nonlinear problem, with one–two and four level models, and for orographic frontal and nongeostrophic complications, is expounded. The various long range problems and their partial solution by machine and graphical techniques are described and illustrated in the second part (by E. N. BLINOVA). They involve 500 and 700 mb N. Hemisphere prognostic charts for several days or weeks. *Subject Headings:* **1. Numerical forecasting techniques 2. Long range forecasting techniques 3. Kibel's method of forecasting.**—*M.R.*

10.2–151 551.509.313:551.513

Burger, Alewyn P. (*National Physical Research Lab., Council for Sci. and Indust. Research, Pretoria*), **Scale consideration of planetary motions of the atmosphere.** *Tellus*, Stockholm, 10(2):195–205, May **1958.** 9 refs., 66 eqs. **DWB, DLC**—The application of scale considerations to atmospheric motions indicates that the equations hitherto used in numerical prediction are unfit for detailed prognosis on the planetary (or very large) scale. It appears that the dominant terms of the vorticity equation in this case are the divergence term and the β-term, which means that the vorticity equation here displays the same quasi-stationary character as the undifferentiated equations of motion. An attempt at expressing more than the quasi-stationary character of the planetary flow leads to undue complication of the equation, even requiring inclusion of the twisting terms. As for the application of the geostrophic approximation, it is confirmed that the β term in the divergence equation is important in the representation of the planetary scale. Further, though metrical terms (containing the reciprocal of the earth's radius) are important on this scale in spherical coordinates, it is shown that, in using the geostrophic approximation and a square grid on a conformal plane projection of the earth's surface, no metrical terms appear. Remarks are also included on a relation of PRANDTL, which loses its validity on the planetary scale, and also on the use of the Richardson number to characterize large scale atmospheric motion. *Subject Headings:* **1. General circulation 2. Vorticity equations 3. Numerical forecasting.**—*Author's abstract.*

10.2–152 551.509.313:551.511.2

Knighting, E.; Jones, D. E. and Hinds, Mavis K. (*all, Met. Office, Dunstable*), **Numerical experiments in the integration of the meteorological equations of motion.** *Royal Meteorological Society, Quarterly Journal*, 84(360):91–107, April **1958.** 5 figs., 9 tables, ref., 12 eqs. **DWB, DLC.** Review in *Nature*, London, 182(4633):440–441, Aug. 16, **1958.**—It is usual to

use finite-difference methods in carrying out the time integration of the equations of motion as adapted to the prediction of the large-scale atmospheric pattern, and this implies a choice of the mesh length and time increment to be used. The effect of changing the size and orientation of the mesh upon the computed values of the vorticities and their advection is examined, and the resulting differences between 24-hr predictions are shown to be important. (For abstract on this title from another source, *see* 8F–154, June 1957, *MAB.*) *Subject Headings:* **1. Numerical forecasting 2. Equations of motion.**—*Authors' abstract.*

10.2–153 551.509.313

Williams, Scott (*Capt., U. S. A. F.*), **An empirical correction to the barotropic forecast.** *Tellus*, Stockholm, 10(2):216–224, May **1958.** 10 figs., 6 tables, 5 refs. **DWB, DLC**—An investigation of error fields in 30 consecutive barotropic forecasts for the 500 mb surface has been performed. It is found that the error fields show persistence in the time to such an extent that a correction consisting of the mean error field for a number of preceding forecasts can be applied to a barotropic forecast with advantage. The improvement of the forecast depends upon the number of preceding forecasts included in the mean error field. The greatest increase in accuracy is found when 10–15 preceding forecasts are contributing to the correction field. The 24 hr forecasts are improved to the greatest extent by the correction, but the 48 hr-forecasts also show a significant increase in accuracy. The same is true to a smaller extent for the 72 hr-forecasts. In Sec. 3, an investigation is made as to whether the height change obtained by making barotropic forecasts from the time-averaged map for the period investigated or from the normal 500 mb map for the corresponding month can be used with the same success as the correction used in Sec. 2. It is found that the correction from the mean chart consistently improved the forecasts. The overall effect is, however, small. The correction obtained from the normal chart did not affect the accuracy of the forecasts appreciably. *Subject Heading:* **1. Barotropic forecast corrections.**—*Author's abstract.*

STRUCTURE AND PHYSICS OF THE ATMOSPHERE

COMPOSITION OF THE ATMOSPHERE

See also: **Aerosol analysis and gas traces, Hawaii** (Junge), 10.2–270; **Soil-atmosphere interchange** (Aujeszky), 10.2–299.

10.2–154 551.501.4:551.510

†Kaeppeler, Hans J. and Krause, H. G. L., **Thermodynamische Zustandsgrössen und Stoffwerte für Luft bei Dissoziationsgleichgewicht.** [Thermodynamic quantities and constants for air at dissociation equilibrium.] *Stuttgart. Forschungsinstitut für Physik der Strahlantriebe, Mitteilungen*, No. 1, Nov. **1954.** 40 p. 21 diagrs. (some fold.), 4 tables, 36 refs. **DLC**—A book of tables and nomograms giving detailed and critically analyzed summaries of available knowledge on physical constants for air at thermodynamic equilibrium. Enthalpy, entropy, specific heat, viscosity and conductivity of dissociating gas mixtures, influence of NO-ionization, enthalpy as a function of temperature, etc., for constant pressures of 0.01, 0.1 and 1 atmosphere from 500–8000 K, and Prandtl numbers for air. *Subject Headings:* **1. Gas constants for air 2. Thermodynamic properties of air 3. Dissociation equilibrium 4. Constants 5. Nomograms.**—*M.R.*

10.2–155 551.510.4:551.594.6

Storey, Owen (*Defence Res. Board, Ottawa*), **Protons outside the earth's atmosphere.** *Annales de Géophysique*, Paris, 14(2):144–153, April/June **1958.** 4 figs., 6 refs., 4 eqs. French and English summaries p. 144. **DLC**—The evidence is surveyed for the belief that hydrogen is the main ionizing constituent of the earth's atmosphere at great heights. If this view is correct, it should be possible to detect the protons by making precise measurements of the dispersion curves of whistling atmospherics observed at low latitudes. *Subject Headings:* **1. Atmospheric composition 2. Upper atmosphere 3. Whistling sferics.**—*Author's abstract.*

ATMOSPHERIC POLLUTION

See also: **Air pollution survey, N. Y.-N. J. area** (Interstate Sanitation Comm.), 10.2–16; **Air pollution transport, N. Y.-N. J. area** (Megonnell), 10.2–19; **Coalescence of nuclei on dust** (Mikhel'son), 10.2–268.

10.2–156 551.510.42:546.16

Adams, Donald F. (*State College of Washington, Pullman*), **Further applications of the limed filter paper technique in fluorine air pollution studies.** *Air Pollution Control Association, Journal,* 7(2):88–91, Aug. **1957.** fig., 5 tables, 11 refs. **DWB, DLC**—Different plant materials were used to study fluoride air pollution at different locations under duplicated shelters. Lime paper fluoride levels were used to test the relationship between the fluoride accumulated in the herbage during the growing season. Consideration asked for further examination of details and the comparison of weather patterns for the exposure periods of the sheltered plants. *Subject Headings:* **1. Atmospheric pollution studies 2. Limed filter paper technique 3. Fluorine.**—*N.N.*

10.2–157 551.510.42

Barnebey, H. L. and Davis, W. L. (*both, Barnebey- Cheney Co., Columbus, Ohio*), **Determining organic vapor concentration in air.** *Air Pollution Control Association, Journal,* 7(2):86–87, Aug. **1957.** 3 figs. **DWB, DLC**—Apparatus and reagents are used to remove both the contaminants and the water vapor from the air stream. Procedures are described. A discussion of how to determine the contaminants and the calculations involved is supplied. Quantitative removal and the analysis of volatile contaminants in air streams are test-proven. *Subject Headings:* **1. Atmosphere pollution contaminants 2. Air sampling and analysis.**—*N.N.*

10.2–158 551.510.42

Georgii, Hans-Walter, **Über Messungen der Scheindiffusion von Aerosolen in der Bodennahen Luftschicht.** [Measurements of apparent diffusion of aerosols in the layer of air near the ground.] *Geofisica Pura e Applicata,* Milan, 36:127–137, Jan./April **1957.** 7 figs., 18 refs. German and English summaries p. 127. **DLC**—Air, tagged with artificial aerosols (diesel oil, magnesium oxide, etc.), was used to determine the austausch in trenches or ditches. The air exchange by turbulent mixing is deduced from the decrease with time in concentration of the aerosols used. Sedimentation and coagulation of the particles must be taken into account in calculating the diffusion by this method. Measurements were made by optical methods (Leitz tyndallometer). Results are presented in graphical form—i.e., nomograms showing decrease in aerosol concentration with time with different stability or wind speed values. The concentration decreases exponentially during calms or low wind speeds. *Subject Headings:* **1. Aerosol diffusion near the ground 2. Aerosol concentration.**—*M.R.*

10.2–159 551.508.95:551.510.42

Haines, George F., Jr.; Hemeon, Wesley C. L. (*both, Hemeon Associates*) and Cember, Herman (*Univ. of Pittsburgh*), **Method for tracing the ground-level distribution of stack gas emissions.** *Air Pollution Control Association, Pittsburgh, Pa., Journal,* 7(4):262–265, Feb. **1958.** 5 figs., table, 7 refs. **DWB, DLC**—A new automatic apparatus has been recently developed for testing stack gas by the introduction of a small quantity of concentrated antimony oxide powder. The sensitivity of this oxide as a tracer is high. The powder dispenser, field test procedures, analyses of samples and their applications are described. *Subject Headings:* **1. Atmospheric pollution tracing 2. Air sampling and analysis 3. Stack effluents.**—*N.N.*

10.2–160 551.510.42

Manos, Nicholas E. (*U. S. Dept. of Health*), **Meteorology and air pollution.** *American Meteorological Society, Bulletin,* 38(10):620, Dec. **1957. DWB, DLC**—A short review of the work of the Air Pollution Medical Program of the U. S. Public Health Service. Laboratory, community and statistical studies are conducted, and meteorology is one of the most significant factors, both in dissemination of pollution and in the state of people's health. Two community studies are in progress (Donora, Pa. and in Calif.). An index of air pollution will be correlated

with causes of death in 163 metropolitan areas. Veterans and insurance as well as census records are being analyzed. The weather effects must be segregated from the pollution effects, per se. Bioclimatological studies are also being conducted. *Subject Headings:* **1. Air pollution meteorology studies 2. U. S. Public Health Service Air Pollution Program.**—*M.R.*

10.2–161 551.510.42

Monkhouse, A. C., **Atmospheric pollution.** *Science Progress*, London, 45(179):418–428, July **1957. DWB**—The history of pollution is outlined from 1661 to the London fog of Dec. 5–9, 1952, and resulting Clean Air Act of 1956. Processes of combustion of coal in factories and houses are outlined. Emission and removal of grit and dust and SO_2 are considered; the latter is still unsolved. Motor vehicle exhausts (petrol and diesel engines) are next considered. Finally, meteorological conditions, especially turbulence and its diurnal variation, are discussed. *Subject Heading:* **1. Atmospheric pollution.**—*C.E.P.B.*

10.2–162 551.510.42:546.172.6

Riesz, Charles H.; Morritz, Fred L. and Franson, Karl D. (*all, Armour Research Found., Illinois Inst. of Tech.*), **Catalytic decomposition of nitric oxide.** *Air Pollution Foundation, San Marino, Calif., Report*, No. 20, i.e. 2(8), May **1957.** 22 p. fig., 10 tables, 14 refs. **DWB**—In order to reduce the amount of NO (nitric oxide) present in automobile exhaust, and thus reduce smog, eye irritation, etc., 21 selected commercial catalysts and 17 laboratory prepared catalysts were tested to see whether they would assist in the reaction $2\ NO \rightarrow N_2 + O_2$. None of the catalysts proved very effective. An alternative procedure, the reduction of NO by carbon impregnated with potassium carbonate (H_2CO_3) shows promise. Data for all of the tests, methods used, equipment, etc. are described or presented. *Subject Headings:* **1. Smog reduction techniques 2. NO reduction in auto exhaust.**—*M.R.*

10.2–163 551.510.42

Rogers, Lewis H.; Renzetti, Nicholas A. and Neiburger, Morris (*all, Air Pollution Found., L. A., Calif.*), **Smog effects and chemical analysis of the Los Angeles atmosphere.** *Air Pollution Control Association, Journal*, 6(3):165–170, Nov. **1956.** 6 figs., 8 tables, 8 refs. **DLC**—Results of a large-scale survey conducted by the Air Pollution Foundation in the Los Angeles Basin (1954) are reported and discussed. The measurement of oxidant concentration is found to be the best objective indicator of smog severity. The data presented include values of eye irritation (10 stations), oxidant concentration (12 stations), plant damage and concentration of various pollutants. Tables showing correlation of air pollution values with meteorological factors are included. *Subject Headings:* **1. Smog 2. Los Angeles, Calif.**—*G.T.*

STRUCTURE OF ATMOSPHERE—UPPER ATMOSPHERE—IONOSPHERE

See also: **Aeroclimatology of the Ukraine, U.S.S.R.** (Kravtsova), 10.2–29; **Tropospheric radio wave propagation** (Herbstreit et al.), 10.2–174 and (Norton, Janes) 10.2–176; **Ionospheric winds and E_s drift, College, Alaska** (Anderson), 10.2–249; **High level winds, Cairo-Bombay air route,** 10.2–251; **Ionospheric scattering and VHF radio wave propagation** (Pineo), 10.2–326; **Recombination coefficient** (Krasovskiĭ), 10.2–337.

10.2–164 551.510.53

California. Univ., Inst. of Geophysics. **Upper atmosphere research.** Contract AF 19(604)-111, Final Report, June 30, **1957.** Bibliog. at end of each section, 250 p. numerous figs., 22 tables, numerous eqs.—Various means of investigating the physical state of the upper atmosphere of the earth are discussed. They are classified according to the sources of information, e.g., rocket flights, meteor observations, sound propagation, etc. Each method is described briefly, and typical results concerning temperature, pressure, density, composition, and winds, etc. are given. A distinction is made between the physical quantities which can be measured directly and those which can only be deduced from observations and theories. Tables, graphs, and literature references are part of each chapter. *Subject Headings:* **1. Upper atmosphere research.**—*Author's abstract.*

10.2–165 551.510.52:551.589:551.557(52)

Yamada, H.; Nakamura, S.; Matsuhashi, S.; Arai, E. and Furukawa, K., **Mean charts of upper air in summer and analyses of mean condition of wind aloft for all seasons over Japan (mainly in summer).** *Journal of Meteorological Research*, Tokyo, 9(11):757–810, Nov. **1957.** numerous figs., 7 tables, 6 refs., eqs. In Japanese; English summary p. 757. **DWB, DLC**—Recently the authors published the two papers, **Mean charts of upper air in winter over Japan** and **Mean condition of wind aloft in winter over Japan** (*see* 7.2–196, Feb. 1956, *MAB*), in which the monthly mean geostrophic wind was described during six-month periods, Nov. to April of 4 yrs (1949–1953). This paper is a continuation of the above papers, and the same study was made during six-month periods, May to Oct. of 4 yrs (1950–1953). The contour charts, ascent curves at selected stations and geostrophic wind in terms of the monthly mean values are described in Pt. 1. In Pt. 2, the analysis is made based on the data of Pt. 1, together with those of a year (12 months). The geostrophic winds used in these analyses are calculated every 2 degrees of latitude from 30° to 44°N along the meridian 140°E at the levels of 700, 500, 300, 200 and 100 mb. The relation of the temperature field to wind aloft is discussed, using thickness. The main results are as follows: (1) The monthly mean patterns of upper wind, at a glance, do not show such large yearly differences, but a close examination reveals some yearly changes, especially in the positions of jet stream in all seasons and easterly zones in summer. (2) The seasonal change of wind velocity at 200 mb level is large in the southern part of Japan and small in the northern part. As a matter of course, the velocity is maximum in winter and minimum in summer. The seasonal range of monthly mean wind velocity is about 80 m/sec, which is twice as large as that at 500 mb level. (3) In both May and June, the latitudinal distributions of wind velocity at 200 mb level show the double maxima, being located at nearly 36°N and 42°N. (4) The variation of monthly mean wind direction for a year is small in comparison to that of its speed. As for the normal condition of 4 years, all the wind directions for the six months, Nov. to April, are westerly (281°–259°), while those for the remaining six months are ESE (258°–237°). The seasonal ranges of monthly mean wind direction at the levels of 700, 500 and 200 mb are 40°, 30° and 20°, respectively. *Subject Headings:* **1. Monthly mean upper air charts 2. Geostrophic wind analysis 3. Synoptic climatology of Japan 4. Japan.**—*Authors' abstract.*

10.2–166 550.384.5:551.510.53 525.3 539.19

Maeda, Ken-ichi (*Dept. of Electronics, Kyoto Univ.*), **Distortion of the magnetic field in the outer atmosphere due to the rotation of the earth.** *Annales de Géophysique*, Paris, 14(2): 154–166, April/June **1958.** 3 figs., table, 7 refs., 40 eqs. French and English summaries p. 154. **DLC.** Also in: *Japan. Science Council. Ionosphere Research in Japan*, 11(3): 116–129, Sept. **1957. DWB**—The paper deals with the possibility of shearing distortion of the magnetic equator in the outer atmosphere, which was suggested from the cosmic ray evidence revealed by J. A. SIMPSON. The magneto-hydrodynamic wave equation was deduced and some approximations of the wave equation were discussed. Assuming a cavity surrounding the earth, which is formed due to the revolution of the earth, the fields were obtained, which must be generated by the non-axisymmetric component of the earth's dipole moment rotating with the earth. It is shown that by these fields induced in- and outside of the cavity, the dip equator will be made to shift westwards to the outer atmosphere. *Subject Headings:* **1. Distortion of the magnetic equator 2. Upper atmosphere 3. Cosmic rays 4. Rotation of the earth.**—*Author's abstract.*

10.2–167 551.510.53

Oldenberg, O. (*G R D, A. F. Cambridge Res. Center, Bedford, Mass., and Lyman Lab., Harvard Univ., Cambridge, Mass.*), **Trends in laboratory research related to aeronomy.** *Annales de Géophysique*, Paris, 14(2):204–205, April/June **1958. DLC**—Guiding ideas for laboratory researches on problems of aeronomy. *Subject Heading:* **1. Aeronomy.**—*Author's abstract.*

10.2–168 551.510.535:551.593.12:621.396.8

Briggs, B. H. (*Cavendish Lab., Cambridge*), **Diurnal and seasonal variations of spread-F ionospheric echoes and the scintillations of a radio star.** *Journal of Atmospheric and Terrestrial Physics*, London, 12(2/3):89–99, **1958.** 7 figs., table, 12 refs. **DLC**—A comparison

is made of the spread-F ionospheric echoes observed at Slough (52°N) and Inverness (57°N). It is found that the degree of spreading is greater at the station of higher latitude. The diurnal and seasonal variations are similar at the two stations. The diurnal and seasonal variations of the scintillation index of the radio star in Cassiopeia are explained in terms of measured ionospheric parameters (spread-F index and critical frequency) together with the change of zenith angle of the source. A large seasonal anomaly, which was previously thought to exist, is found to be much reduced when all the relevant factors are taken into account. *Subject Headings:* **1. Spread F variations 2. Ionospheric echoes 3. Radio star scintillation.**—*Author's abstract.*

10.2–169 551.510.535:537.531:551.590.24

Elwert, Gerhard (*Astron. Inst. of the Univ., Tübingen, Gr.*), **Die Verteilung der Röntgenstrahlung der Sonnenkorona über die emittierende Fläche und die Restintensität bei totalen Sonnenfinsternissen.** [Distribution of X-rays emitted by the solar corona and the residual intensity during solar eclipses.] *Journal of Atmospheric and Terrestrial Physics*, London, 12(2/3):187–199, **1958.** 6 figs., 14 refs., 20 eqs. German and English summaries p. 187. **DLC**—In the interpretation of the time changes of the electron density in the E layer during total eclipses, it has usually been assumed that the intensity of the ionizing radiation is proportional to the area of the optically visible solar disk. Recently, however, it was found that a residual amount ΔJ of the intensity J remains. It is probable that the formation of the E layer is mainly due to a long wave X-ray radiation of the corona. The distribution of that radiation over the emitting area of the undisturbed corona is studied in this paper, taking into account the self-absorption of these lines. A brightening near the edge is found. Therefore the value of $R=\Delta J/J$ depends on the ratio η of the apparent lunar radius to the solar radius, which may differ appreciably from one eclipse to the other. Because of the ellipticity of the corona, the radiation comes mainly from the equatorial region. Using WAHRMEIER's model for the density distribution of the electrons, for the residual radiation R one finds, with $\eta=1.02$ (valid for the eclipses of 1952 and 1954), about 17–22%, with $\eta=1.06$ (eclipse of 1955) about 10–12%. These results may be used for an interpretation of the ionospheric observations; if necessary, the contributions of local sources will have to be taken into account also. *Subject Headings:* **1. X-rays emitted during solar eclipses 2. Electron density in E layer.**—*Author's abstract.*

10.2–170 551.510.535:551.594.12

Ferraro, V. C. A. and Özdoğan, I. (*Queen Mary's Coll., London, E.*1), **Effect of diffusion on the vertical distribution of ionization in a quiet F-region.** *Journal of Atmospheric and Terrestrial Physics*, London, 12(2/3):140–149, **1958.** 5 figs., 5 refs., 22 eqs. **DLC**—The vertical distribution of ions in a quiet F region is calculated on the assumption that electrons disappear by attachment to neutral molecules and by diffusion. The coefficient of attachment, K, is assumed to be constant and the value of the coefficient of diffusion, D, adopted is that calculated according to the classical theory of gases. Adopting numerical values of the molecular air density and temperature in the F region inferred from rocket data, it is found that diffusion produces a diurnal oscillation in the level of maximum ionization characterized by a rapid rise soon after sunrise followed by a slower fall of level which continues till dawn. It is suggested that, since this is at variance with the observed behavior of the height of the F2 region, the adopted value of the coefficient of diffusion may be too large by a factor of 10. It is also inferred that the value of K is likely to be smaller than the value suggested in recent work of RATCLIFFE et al. (1956) and that its value is probably somewhat smaller than 10^{-4}sec^{-1} at levels lower than 300 km. *Subject Headings:* **1. F layer ionization 2. Diffusion effects on vertical ionization.**—*Authors' abstract.*

10.2–171 551.510.535:551.510.62

Gregory, J. B. (*Physics Dept., Canterbury Univ. College, Christchurch, N. Z.*), **The relation of foreward scattering of very high frequency radio waves to partial reflection of medium frequency waves at vertical incidence.** *Journal of Geophysical Research*, Wash., D. C., 62(3):383–388, Sept. **1957.** 5 figs., 7 refs. **DLC**—A comparison is made between published VHF forward-scatter data and results of vertical-incidence investigations of the lower iono-

sphere, mainly at a frequency of 1.75 Mc/s. The received waves in each type of transmission are shown to have many similar characteristics, such as temporal variations, and to originate in the same height regions. It is concluded that the two types of transmission have a common origin. *Subject Headings:* **1. VHF radiowave scattering 2. Vertical incidence records.**—*Author's abstract.*

RADIO PROPAGATION

See also: **Radiometeorology** (Marshall, Gordon), 10.2–18; **Anomalous radio propagation** (Coroniti), 10.2–336.

10.2–172 551.510.62:621.396

Bean, B. R. and Horn, J. D., **On the climatology of the surface values of radio refractivity of the earth's atmosphere.** *U. S. National Bureau of Standards, NBS Report* 5559, March 3, 1958. 17 p. 12 figs., 3 tables, 15 refs. **DWB** (621.384 U585on)—World-wide maps of the monthly mean value, N_s, of the radio refractivity of the atmosphere near the earth's surface are given in terms of the refractivity reduced to sea level: $N_0 = N_s \exp(+0.03222\,h)$, where h is in thousands of feet. The use of N_0: (a) allows refractivity contours to be derived even in areas where the terrain changes rapidly and; (b) reduces the range of refractivity isopleths by about one third. A map is also given on the maximum range of monthly mean values of N_s. Examples are given of the application of these data to the prediction of: (a) the total bending of radio rays; and (b) the geographic, seasonal, and year to year variation of VHF-UHF radio transmission loss. *Subject Headings:* **1. Radio wave reflection 2. Radio refractivity of earth's atmosphere.**—*Authors' abstract.*

10.2–173 551.510.62:621.396

Crombie, D. D. (*Phys. Lab. D.S.I.R. Lower Hutt, New Zealand*), **Differences between the east-west and west-east propagation of VLF signals over long distances.** *Journal of Atmospheric and Terrestrial Physics*, London, 12(2/3):110–117, 1958. 3 figs., 3 tables, 10 refs., 2 eqs. **DLC**—An early suggestion by Round, Eckersley, Tremellen and Lunnon that VLF signals received from the west are less attenuated than those from the east is investigated. The original evidence, together with further experimental data, give strong support to the hypothesis. The outline of a possible explanation of the effect is given. *Subject Headings:* **1. VLF fading 2. VLF radio wave propagation.**—*Author's abstract.*

10.2–174 551.510.62:551.510.52

†Herbstreit, J. W.; Rice, P. L. and Sprecker, E. B., **Survey of Central Radio Propagation Laboratory research in tropospheric propagation.** *U. S. National Bureau of Standards, NBS Report*, No. 3520, Jan. 1, 1955. 127 p. plus 22 supplements, separately paged. Brief abstracts of 314 publications concerned with the NBS tropospheric propagation research program from beginning. Author index to these pubs. p. 116–117, Supplementary list of the 22 supplements (text of papers, or excerpts from papers). **DWB**—This report summarizes and abstracts publications concerned with the National Bureau of Standards tropospheric propagation research program dating back to the formation of the Central Radio Propagation Laboratory. Some technical papers are reproduced here as supplements to this report and excerpts from some of the longer technical reports are also included. *Subject Headings:* **1. Tropospheric radio wave propagation 2. Abstracts 3. Central Radio Propagation Laboratory.**—*Authors' abstract.*

10.2–175 551.510.62

*Mathur, Prem N. and Mueller, Eugene A., **Radar back-scattering from non-spherical scatterers, Pt. 1, Cross-sections of conducting prolates and spheroidal functions. Pt. 2, Cross-sections from nonspherical raindrops.** *Illinois. State Water Survey Div., Report of Investigation*, No. 28, 1955. 85 p. 33 figs., 23 tables, 17 refs., 49 eqs. **DLC**—Studies were made of the scattering from nonspherical targets by making exact determination of the nose-on radar back scattering cross sections of conducting prolate spheroids of various sizes and shapes. The scattering coefficients and several complex prolate spheroidal functions

appearing in the analysis have been computed. Numerical data, which are of importance in other similar studies of radar scattering, acoustic and ballastic scattering and antenna radiation problems involving prolates of dimensions below the resonance region, are reported. Curves are given for the back scattered cross sections as a function of nondimensional size and shape parameters for prolate spheroids. The results are compared with the RAYLEIGH-GANS first order approximation and STEVENSON's third order approximation and the range of applicability of these approximations is evaluated. The results indicate a substantial decrease in the radar echo as the shape of the equivolumetric targets vary from spherical to thin prolate spheroidal shapes. For a prolate of axis ratio $b/a=0.8$ and $\alpha=0.8$, the ratio σ prolate/σ sphere is about 1/2 and decreases to a value of approximately 1/200 for a prolate spheroid of axis ratio $b/a=0.2$ $\alpha=0.8$. RAYLEIGH-GANS first order approximation is not adequate for the size range $\alpha>0.3$ However, STEVENSON's third order solution yields results nearly identical with the exact values in the size range $\alpha<1.0$. *Subject Headings:* **1. Radar echoes 2. Nonspherical scatterers** —*Authors' abstract.*

10.2–176 551.510.62:551.510.52:621.396

Norton, K. A. and Janes, H. B., **Rate of fading in tropospheric propagation.** *U. S. National Bureau of Standards, NBS Report*, No. 3520, Jan. 1, **1955.** Supplement 7. 6 p. 3 figs., 7 refs., 9 eqs. **DWB**—In this paper an analysis of tropospheric fading is presented. Fading rate is defined to be the number of times per minute that the envelope of the received field crosses its median level with a positive slope. It is shown that this definition of fading rate not only provides a quantity which is easily determined from the experimental data but also provides a quantity which is readily identifiable with the parameters of the propagation medium. It is shown that this definition is as useful in the intermediate range of distances where the scattered component of the received field is comparable to the diffracted component as it is at the larger angular distances where the scattered component predominates. *Subject Headings:* **1. Radio fading 2. Tropospheric radio wave propagation.**—*Authors' abstract.*

10.2–177 551.510.62

Poeverlein, Hermann (*U. S. Air Res. & Dev. Comm., Bedford, Mass.*), **Low-frequency reflection in the ionosphere, Pt. 1.** *Journal of Atmospheric and Terrestrial Physics*, London 12(2/3):126–139, **1958.** 14 refs., 44 eqs. **DLC**—A theory of low-frequency reflection in the ionosphere is developed. At wavelengths long compared to the layer thickness, the ionospheric layer is considered as a thin, conductive sheet, that leads to a discontinuity of the electromagnetic field. A thicker layer is subdivided into many thin (or differential) sublayers. The field is then thought of as a superposition of many partial waves, each of which is reflected by an individual sublayer. An additional penetrating wave must be assumed. At the lowest frequencies—that is, in the case of thin-sheet reflection—the currents in the layer are horizontal and the reflection is of the metallic type, always showing reversal of the horizontal E-component. Dielectric-type reflection with sign or phase transition at the Brewster angle is obtained at somewhat higher frequencies, if vertical and horizontal current density components are of comparable magnitude. The present first part of the paper deals with the thin-sheet reflection theory and the fundamentals of the general theory. Specialized cases of the general theory and some consequences will be discussed in the second part. The frequencies under consideration are roughly 1–100 kc/s. *Subject Heading:* **1. Ionospheric radio wave reflection** —*Author's abstract.*

10.2–178 551.510.62:551.507.352

Rogers, G. L., **An experimental verification of diffraction microscopy, using radio waves.** *Journal of Atmospheric and Terrestrial Physics*, 11(1):51–53, **1957.** 6 refs. **DWB**—A DC-3 airplane was flown over 3 spaced radio receivers at 4000 and 8000 ft and fading of 125 mc radio wave length was recorded photographically. The amplitude of the main wave fluctuated from 97–103% of undisturbed amplitude, equivalent to a scatter of 0.09% of energy, but projected area of DC-3 is only 0.028% of Fresnel half-period zone. The 3-fold increase in effective projected area is attributed to conduction. *Subject Headings:* **1. Radio fading 2. Airplane radio interference.**—*C.E.P.B.*

RADIOACTIVITY

See also: **Beryllium-10 in deep-sea sediments** (Goel et al.), 10.2–67; **Radioactivity in sea water, N. Pacific** (Miyake), 10.2–68.

10.2–179 551.510.721:551.509.58

Hsu, Pao-chin, **How to predict the covered area of radioactive fallout after nuclear detonation.** *Meteorological Bulletin*, Taipei, Formosa, 3(4):5–8, Dec. **1957.** 5 figs., 3 refs. In Chinese. English summary p. 5. **DLC** (Orientalia)—After a nuclear detonation, the radioactive fallout generally spread a considerable distance through down wind to reach the ground. This article gave an illustration of predicting where the radioactive particles will be found and the time when the radioactive particles will reach the ground. *Subject Heading:* **1. Radioactive fallout pattern forecasting.**—*Author's abstract.*

10.2–180 551.510.721:551.576

*Wilkins, Eugene M. (*U. S. W. B., Wash., D. C.*), **Effective coefficients of diffusivity for atomic bomb clouds at one thousand to two thousand miles.** *American Geophysical Union, Transactions*, 39(1):58–59, Feb. **1958.** table, 5 refs. **DWB, DLC**—Twelve profiles of radioactivity in nuclear clouds obtained in Jan.–Feb. and Oct.–Nov. 1951 by aircraft probes at 8000 to 25,000 ft altitude, and at distances of 980 to 1760 naut mi from the Nevada test site, and 28 to 56 hrs after the detonation, are tabulated and the effective coefficients of diffusivity calculated to be 0.8 to 4.6 (average value of $K=2.7$) times 10^8 cm^2 sec^{-1} compared with 6 to 390×10^8 cm^2 sec^{-1} for moisture diffusion along an isentropic surface and 4×10^8 cm^2 sec^{-1} for constant level balloons. The distances are the meteorological path lengths of the cloud which may have travelled twice the straight line distance from the source to sampling point. *Subject Headings:* **1. Radioactivity profiles in nuclear clouds 2. Diffusivity coefficient of nuclear clouds 3. Nevada.**—*M.R.*

10.2–181 551.510.721:551.501.9

§List, Robert J. (*U. S. W. B., Wash., D. C.*), **The concentration of nuclear debris in the air as a meteorological variable.** *American Meteorological Society, Bulletin*, 39(5):276–278, May **1958.** 3 figs., 2 refs. **DWB, DLC**—The U. S. Public Health Service and Atomic Energy Commission network of 30 radioactivity monitoring stations in the U. S., Hawaii and Alaska (which opened during the Operation Redwing Atomic test series May–July 1956 in the Marshall Islands) is described and three examples of synoptic situations and accompanying radioactivity patterns are shown. Areas with $>2\mu\mu$C/m^3 of air are hatched. Some of the patterns (May 7–10) associated with polar highs may have come from Russian tests in March–April since the debris could not have come from the Marshall Islands in two days. Downward mixing from 10,000 ft to surface is evident. The June 9–15 series shows persistence of debris over the Southern Rockies in spite of movements of surface fronts. This is believed to be due to mountain effects in bringing down contamination from high level southwesterly currents and perhaps to the higher altitude of the stations. Finally, on Aug. 17–20, 1956, a fresh polar air mass cleaned out the surface contamination which had persisted over the entire southern part of the U. S. In 1957 the U.S.P.H.S. reestablished the network (increased to 40 stations). *Subject Headings:* **1. Radioactivity monitoring networks 2. Synoptic effects on atmospheric radioactivity 3. Atmospheric radioactivity sampling 4. United States.**—*M.R.*

10.2–182 551.510.721:551.577.7

Wilkins, Eugene M. (*U. S. W. B., Wash., D. C.*), **Precipitation scavenging from atomic bomb clouds at distance of one thousand to two thousand miles.** *American Geophysical Union, Transactions*, 39(1):60–62, Feb. **1958.** fig., table, 3 refs. **DWB, DLC**—A convenient rule of thumb is developed for estimating radioactive fallout in precipitation from nuclear clouds at distances of 1000–2000 mi for debris at and below the rain-forming layer. The rule states that rain, falling through bomb cloud radioactivity greater than about 100 times background, causes deposition activity in excess of 10,000 dpm/ft^2 day. A method is suggested for making a crude estimate of the areal distribution of radioactive rainout which should be applicable under circumstances similar to those in the examples analyzed. Based on data from Oct.–Nov. 1951 tests in Nevada. The fallout reached the East Coast from Maine to Florida

and as far south as Texas. *Subject Headings:* **1. Radioactive fallout 2. Radioactivity in precipitation 3. Areal radioactive rainout distribution.**—*Author's abstract.*

10.2–183 551.510.721:551.577.7

Setter, Lloyd R. and Straub, Conrad P. (*both, Robt. A. Taft Sanitary Eng. Center, Col. Pkwy, Cinn., Ohio*), **The distribution of radioactivity from rain.** *American Geophysical Union, Transactions*, 39(3):451–458, June **1958.** 5 figs., 2 tables, 14 refs. **DWB, DLC**—Under conditions similar to Cincinnati, Ohio, fallout is the result of rainout and snowout. Without precipitation there is little fallout even though the particulate activity of surface air is abnormally high. Much of the suspended activity in cistern water from rain will be removed by sedimentation. Over 90% of both the suspended and dissolved fallout becomes associated with soil and vegetation rather than appearing in surface waters. From the spring of 1953 to Jan. 1957, the fallout of strontium^{90} (Y^{90}) in Cincinnati, Ohio, is estimated to be at least ten and probably not more than 30 millimicrocuries per square meter of surface area. *Subject Headings:* **1. Radioactivity in rainwater 2. Radioactive fallout propagation.**—*Authors' abstract.*

MECHANICS AND THERMODYNAMICS OF THE ATMOSPHERE

See also: **Latent heat release** (Aubert), 10.2–149; **Turbulent transfer of heat** (Malkevich), 10.2–227; **Reynolds stress** (Palm), 10.2–242; **Moisture exchange over continents, W. Siberia** (Orlova), 10.2–257.

10.2–184 551.511

Gandin, L. S. and Dubov, A. S., **K voprosu o kachestvennom analize uravneniia vikhria.** [Problem of the qualitative analysis of the equations of vorticity.] *Meteorologiia i Gidrologiia*, Leningrad, No. 4:36–37, April **1957.** 7 refs. **DWB, DLC.** English trans. available. **DWB** (M510 G195on)—The author points out that L. T. Matveev's article **Pravila kachestvennogo analiza uslovii vikhreobrazovaniia v atmosfere . . .** (*Met. i Gid.* No. 4, **1956.** [Rules for the qualitative analysis of the conditions for the formations of vortices in the atmosphere . . .]) contains several inaccuracies. The effect of temperature advection upon local vortical variation is not evaluated correctly. The term

$$\frac{2\omega_z}{T}\left(U_g\frac{\partial T}{\partial x}+V_g\frac{\partial T}{\partial y}\right)$$

in the vortex equations which derives the effect of advection is insignificant. Matveev's conclusions on the growth of a vortex during the cold advection and its decline during heat advection do not follow from his equations. *Subject Heading:* **1. Vorticity equations.**—*I.L.D.*

10.2–185 551.511:551.524.4

Hodge, Mary W. (*U. S. W. B., Wash., D. C.*), **Superadiabatic lapse rates of temperature in radiosonde observations.** *Monthly Weather Review*, Wash., D. C., 84(3):103–106, March **1956.** 3 figs., 3 refs. **DWB, DLC**—Various types of superadiabatic atmospheric lapse rates of temperature recorded by radiosondes are described and their possible causes are considered. The superadiabatic lapse rates at or near cloud tops observed at Hilo, Hawaii are analyzed, and its is suggested that they are produced in some instances by adiabatic lifting. This phenomenon may be the result of several processes, such as (1) cooling at the saturated dry air interface as a result of adiabatic lifting, (2) "evaporative cooling at the cloud top and (3) evaporative cooling of the thermistor, if wet, as it emerges from the cloud top." *Subject Headings:* **1. Superadiabatic lapse rates 2. Adiabatic lifting 3. Evaporative cooling 4. Hilo, Hawaii.**—*I.L.D.*

10.2–186 551.511:551.509.33

Kubota, S. (*Met. Res. Inst.*), **Technical improvements of the Kubota-Kurihara's method of integration of the vorticity equation.** *Papers in Meteorology and Geophysics*, Tokyo, 8(1):65–80, April **1957.** 3 figs., 4 tables, 7 refs., 12 eqs. **DWB**—We have proposed the method of integration of the vorticity equation, called the quasi-double-Fourier method, or the method of one-dimensional Fourier series with one-dimensional relaxation. In this paper, some technical

improvements made thereafter are presented, namely: the enlargement of forecasting area, the increase of wave numbers adopted in calculation, the employment of inverse matrices in relaxation, and the smoothing process. *Subject Headings:* **1. Vorticity equations 2. Forecast improvement.**—*Author's abstract.*

10.2–187 551.511.12:551.501.7:518.3

Slobodov, B. Ia., **Ob opredelenii geopotentsial'nykh vysot, energii neustoĭchivosti i zapasa energii tsirkuliatsii.** [The determination of geopotential height, energy of instability and the storage of energy of circulation.] *Meteorologiia i Gidrologiia*, Leningrad, No. 1:29–32, Jan. **1956.** 2 figs., 3 refs., 2 eqs. **DWB, DLC**—An attempt is made to fill in the gap of geopotential thickness existing between the principal isobaric surfaces of 1000, 850, 700, 500, 300 and 200 mb, and develop a graphical method for determining by means of an analytic diagram the thickness of any layer, on the basis of data obtained by vertical sounding. The essence of this method is as follows. The geopotential thickness layer is proportional to an area bordered on the left by the isotherm $T=0$, on the right by a curve of stratification (according to vertical temperature), below by the straight line $p_0=$const. and above by the straight line $p=$const. The equation underlying this method and a nomogram for determining geopotential height are presented. *Subject Headings:* **1. Geopotential height 2. Nomograms.**—*I.L.D.*

10.2–188 551.511.13:551.507.321

Guterman, I. G., **Ob adiabaticheskom izmenenii temperatury gaza vnutri podnimaiushchegosia shara.** [Adiabatic temperature change of the gas in an ascending balloon.] *Meteorologiia i Gidrologiia*, No. 4:34–35, April **1956.** ref., 5 eqs. **DWB, DLC**—The precision of the method of constant level balloons used to measure vertical motion in the atmosphere depends upon the temperature change within the balloon during its ascent by means of the equation relating adiabatic change in temperature with change in pressure, and the hydrostatic equation. It is shown that the change in temperature of hydrogen parcels within a balloon ascending in the atmosphere (but not in a hydrogen environment) is the same as the temperature change of ascending particles of unsaturated air. Formula

$$\frac{dT_i}{dz} = -\frac{gR_i}{c_{pi}R_b}$$

serves to calculate the magnitude of the temperature gradient within an ascending balloon filled with hydrogen. *Subject Headings:* **1. Adiabatic temperature changes 2. Vertical motion 3. Balloon temperature change 4. Balloon ascents.**—*I.L.D.*

10.2–189 550.38:551.511.13

Jirlow, K. (*Royal Inst. of Tech., Stockholm*), **Experimental investigation of the inhibition of convection by a magnetic field.** *Tellus*, Stockholm, 8(2):252–253, May **1956.** fig., table, 5 refs., eqs. **DLC**—The author discusses the theory of stability of a layer of fluid heated below, as developed by RAYLEIGH and extended by CHANDRASEKHAR, to the case where the fluid is an electrical conductor and an external magnetic field is introduced into the fluid. According to CHANDRASEKHAR, the magnetic field delays the onset of convection so that the critical Rayleigh number is $R_c > R_0$. Experiments with an external magnetic field and a mercury fluid to determine the critical temperature when convection begins are described, and the critical values of R_c are calculated and confirmation of CHANDRASEKHAR's hypothesis was obtained. *Subject Headings:* **1. Magnetic effects 2. Convection.**—*I.L.D.*

10.2–190 551.511.13:551.524:551.526

Samochkin, V. M., **Ispol'zovanie uravneniia teplovogo balansa pri utochnenii formul dlia podscheta teplopoter' s vodnoĭ poverkhnosti.** [Use of the equation of thermal balance for making more precise the formula for calculating thermal losses from a water surface.] *Meteorologiia i Gidrologiia*, Leningrad, No. 2:35–37, Feb. **1956.** fig., 2 tables, 6 refs. **DWB, DLC.** Trans. into English available for reference. **DWB** (M11 S19lu)—By means of calculations of the thermal regime of the Obe River and the upper waters of the Novosibirsk Hydro-Electric Station, calculated by the compensation of PASTROVICH, extensive data were obtained on the heat exchange between water surface and air. These colorimetric observations showed

that, in terms of structure and constituents, the formulas of D. N. Bibikov, P. P. Kuz'min, V. V. Piotrovich, N. P. Polevoi and K. I. Possinskii (all given in a table) express satisfactorily the process of heat loss from the water surface during fall-winter, but owing to differences in the constants of the various formulas, calculations yield different values for the same hydrometeorological conditions. In order to describe the heat exchange of the water surface with the atmosphere, the author utilizes the equations of heat balance of a part of the river without inflow of water in the absence of ice formation. *Subject Headings:* **1. Thermal balance of water surfaces 2. Heat exchange sea-atmosphere 3. Thermal balance formulas.**—*I.L.D.*

10.2–191 551.511.2:551.515

Mertsalov, A. N., **Rol' divergentsii-konvergentsii vetra v izmenenii tsiklo-antitsiklonichnosti.** [The role of divergence-convergence of wind in the change of cyclonicity-anticyclonicity.] *Meteorologiia i Gidrologiia*, No. 4:62–65, April **1956.** 2 figs., 2 refs. **DWB, DLC**—The author presents a detailed mathematical analysis of the phenomenon by which at any level in the free atmosphere wind divergence causes a diminution of cyclonicity or an increase of anticyclonicity and wind convergence causes an intensification of cyclonicity or a diminution of anticyclonicity with time. This discussion is based upon an analysis of the equation of motion in a frictionless atmosphere. *Subject Headings:* **1. Divergence 2. Cyclone mechanics.** —*I.L.D.*

10.2–192 551.511.3

Defrise, P. (*Brussels*), **La notion de mécanique interne et la météorologie.** [Idea of internal mechanics and meteorology.] *I.U.G.G. Association of Meteorology, Rome*, 1954, *Scientific Proceedings*. pub. London, Butterworth, **1956.** p. 264–267. fig., ref. **DWB**—The author discusses in a nonmathematical manner the concept of internal mechanics of a continuous environment (solid or fluid) which is applicable to the study of meteorological problems. An internal milieu is characterized by an existence that is independent of any specific reference. Thus the fact that two parcels of air A and B are 1 m apart at the instant t_0 and 2 m at $t_0+\Delta t$ constitutes an internal property. Divergence is an important internal property. The application of this concept of internal mechanics to problems of atmospheric dynamics consisting of numerous milieus is discussed. *Subject Heading:* **1. Dynamics of the atmosphere.**—*I.L.D.*

10.2–193 551.511.3:551.547.3:551.515.11

Vítek, Vojtěch, **Mechanismus výškových změn hladiny nondivergence.** [Mechanism of height variations of the surface of nondivergence.] *Meteorologické Zprávy*, Prague, 9(4):105–108, **1956.** 5 refs., 7 eqs. Russian and English summaries p. 106. **DWB**—Equations are derived for the height of the level of nondivergence, assuming that the isobaric divergence is a linear function of pressure and that the direction of wind shear is constant. Variations in the height of the level of nondivergence are discussed theoretically and a possible role of this level in the mechanism of cyclogenesis is indicated. *Subject Headings:* **1. Nondivergence level 2. Cyclogenesis.**—*Author's abstract.*

10.2–194 551.511.32:551.46:551.573(52)

Ito, N., **On the evaporation from the Japan Sea during the winter monsoon.** *Journal of Meteorological Research*, Tokyo, 10(3):173–178, March **1958.** 4 figs., 2 tables, 11 refs., 20 eqs. In Japanese; English summary p. 173. **Comments** by Ohsawa, K., *Ibid.*, 10(6):535–536, June **1958. DWB, DLC**—The water source of snow falling on the mountainous region in Central Japan, accompanied by the monsoon in winter, is almost evaporated from the Japan Sea. In this case, the temperature difference between air and sea surface is very large, and such a condition is rare all over the world. The author calculated the differences of moistures and those of sensible heat energies in the atmospheric columns between two stations, Vladivostok and Wajima, by means of aerological data. And then he tried to determine the coefficient k in the following evaporation equation:

$$E=k(e_s-e_a)U,$$

E: evaporation, e_s: saturated vapor pressure at the sea surface temperature, e_a: vapor pressure

in air, U: wind velocity. This value of k is close to that derived by H. U. SVERDRUP (1946) on the rough sea surface. *Subject Headings:* **1. Evaporation from seas 2. Japan.**—*Author's abstract.*

10.2–195 551.511.2:517.94

Kao, Shih-Kung, **The quasi-Lagrangian system of hydrodynamic equations with potential temperature as an independent variable.** Johns Hopkins Univ. Dept. of Civil Engineering, Contract AF 19(604)-916, Scientific Report No. 2, July **1956.** 25 p. 10 refs., numerous eqs.—In this paper a system of quasi-Lagrangian equations of motion with potential temperature as the material coordinate is developed. It is shown in this new system of coordinates that the equations of motion and vorticity become simpler in many ways, and that in any quasi-static treatment of atmospheric motion it is possible to eliminate density and vertical velocity. The instantaneous state of atmospheric motion may be determined by the instantaneous field of the Montgomery function and the horizontal velocity on the isentropic surfaces. It is also shown that the planetary wave motion in isentropic surfaces gives a more accurate description than that in a barotropic atmosphere. *Subject Heading:* **1. Equations of motion.**—*Author's abstract.*

GENERAL CIRCULATION

See also: **Jet stream characteristics** (Berggren et al.), 10.2–17; **Arctic temp. data** (Flohn, Seidel), 10.2–38; **Cold air movements, Europe** (Seidel), 10.2–214; **Cold pole and atmospheric circulation, C. Europe** (Maede), 10.2–229.

10.2–196 551.513.1(5–012)

Tang, Mou-tsang (*Inst. of Geophy. and Met., Academia Sinica*), **On the blocking situation of the Eastern Asia and its climatic effects.** *Acta Meteorologica Sinica*, Peking, 28(4):282–293, **1957.** 10 figs., table, 14 refs. In Chinese; English summary p. 293. **DWB, DLC**—In this paper, the seasonal occurrence and geographical distribution of these blocking highs over Eastern Asia are described. Secondly, the precipitation and temperature departures over China during the period of the blocking in summer are studied. Finally, the effects of locations of blocking highs on climatology are also discussed. *Subject Headings:* **1. Blocking situations 2. Far East.**—*Author's abstract.*

10.2–197 551.513.2:551,515

Eliasen, E. (*Univ. of Copenhagen*), **A study of the long atmospheric waves on the basis of zonal harmonic analysis.** *Tellus*, Stockholm, 10(2):206–215, May **1958.** 7 figs., 8 tables, 13 refs., 19 eqs. **DWB, DLC**—Characteristic features of the long atmospheric waves at middle latitudes are discussed on the basis of zonal harmonic analyses of hemispherical weather charts. In the first section mean values of the amplitudes of the waves with wave numbers from 1 to 10 are presented for the 500-mb and the 1000-mb levels. Spectral distributions of the kinetic energy for the eastward and the northward components of the geostrophic wind at the 500-mb level are computed. In Sec. 2 the semipermanence of the waves with wave numbers from 1 to 4 is illustrated. The meridional variation of the waves is investigated in relation to the question about the meridional transport of momentum. On the basis of the vertical variations of the waves of the Jan. and July normal charts, the causes of the semipermanent waves are discussed. The travelling waves with wave numbers 5, 6, and 7 are treated in Sec. 3. Mean speeds of the waves are considered in relation to the mean velocity of the zonal flow. The vertical structure of the waves is investigated by means of the heights of the 1000-mb and 500-mb levels and the temperature field at the 500-mb level. Finally, the speed and vertical structure of the waves are determined theoretically from the solutions of the linear equations in a two-level approximation. *Subject Headings:* **1. Waves in the westerlies 2. Harmonic analysis 3. Synoptic studies 4. General circulation.**—*Author's abstract.*

10.2–198 551.513.2:551.557.5

Endlich, R. M. and McLean, G. S. (*both, A. F. Cambridge Res. Center*), **The structure of the jet stream core.** *Journal of Meteorology*, Boston, 14(6):543–552, Dec. **1957.** 13 figs.,

22 refs., 2 eqs. **DWB, DLC**—Typical jet stream characteristics are illustrated by discussions of an average, a strong and a weak jet stream. The basic data were obtained by aircraft of Project Jet Stream in flights carried out mainly over the southeastern U. S. An empirical model, based on observations obtained during some fifty flights, illustrates the average wind and temperature fields in the vicinity of the jet stream core and the structure of the "jet stream front." It is suggested that this model may be used to define jet stream flow in mid-latitudes. Average distributions of turbulence, clouds and contrails around the jet stream are presented. *Subject Headings:* **1. Jet stream structure 2. Jet stream core 3. Jet stream models 4. Southeastern U. S.**—*Authors' abstract.*

10.2–199 551.513.2:551.557.5

Lee, R. (*Met. Service of Canada*), **Jet streams.** *The Roundel*, Ottawa, Aug. **1956.** p. 16–21. 5 figs. (incl. photos). **DLC.** Also in: *Smithsonian Institution, Wash., D. C., Annual Report, 1957.* pub. **1958.** p. 293–302.—A popular summary of many aspects of the phenomenon known as the jet stream: discovery, research projects, relation to 3 major frontal zones, structure, winds, clouds, height, temperature, forecasting use in aerial navigation, clear air turbulence, tropopause relationship and examples of record flights using jet stream winds. *Subject Heading:* **1. Jet stream.**—*M.R.*

10.2–200 551.513.2:551.558.2

Miller, Albert and Panofsky, Hans A. (*both, Pennsylvania State Univ., Dept. of Met.*), **Large-scale vertical motion and weather in January, 1953.** *American Meteorological Society, Bulletin*, 39(1):8–13, Jan. **1958.** 8 tables, 9 refs. **DWB, DLC**—This paper summarizes the relationships between weather, moisture and large scale vertical motion for Jan. 1953. The moisture parameter was the dew point depression at 850 mb, and vertical velocities at 700 mb were available as computed by three different methods. The probability of clear sky at an individual station varies from five % for moist, ascending air to 93% for dry, descending air. The probability of precipitation for the same conditions varies from 67% to 0%. Incidentally, comparison of vertical velocities of various types indicates that nonadiabatic warming at 700 mb is important only for rapid flow from north to south, then averaging 1.3°C in 12 hrs. The standard errors of the different techniques of computing vertical motion are estimated to vary from 0.9 to 1.4 cm sec^{-1}. *Subject Heading:* **1. Vertical motion.**—*Authors' abstract.*

10.2–201 551.513.3(68)

§Triegaardt, D. O. and Kraus, G. M. E., **An example of wave disruption over Southern Africa.** *South Africa. Weather Bureau, Notos*, 6(1/2):6–12, **1957.** 3 figs., 7 refs. **DWB**—On Dec. 4, 1956 a long wave trough in the westerlies disrupted over Southern Africa and the northern part of the trough remained stationary over the southern tip of the continent for almost three days. Synoptic developments and rainfall patterns during this period are discussed. It is shown that a pronounced confluent thermal jet exists south of the African continent in summer and it is suggested that this thermal jet has a disrupting effect on large amplitude troughs which approach the continent from the west. *Subject Headings:* **1. Waves in the westerlies 2. Troughs 3. Union of South Africa.**—*Authors' abstract.*

10.2–202 551.513.7:551.515.2(52)

Asakura, T. (*Met. Res. Inst., Tokyo*), **A synoptic study on the seasonal change of the general circulation from summer to "Shurin" in 1951.** *Meteorological Society of Japan, Tokyo, Journal*, Ser. 2, 35(5):278–287, Oct. **1957.** 15 figs., table, 9 refs. **DWB, DLC**—In the early autumn or the "Shurin" season of 1951, Japan was dominated by abnormal coolness and persistent rain for a month. In the present study, this abnormal weather condition is investigated based primarily on the 5-day mean and 500 mb charts from the view-point of seasonal change of pattern from summer to Shurin season. As a result, the world-wide shift of flow pattern is found to be responsible for the seasonal weather change in Japan. Furthermore, it is shown that the typhoon appearing in the late summer does a trigger action on the seasonal change of westerlies, causing cold air to shift southward and warm air northward, which is the main cause bringing about a seasonal change in large scale pattern and seasonal weather change in Japan. *Subject Headings:* **1. Seasonal weather changes 2. Atmospheric circulation anomalies 3. Japan.**—*Author's abstract.*

10.2–203 551.513.7:551.515.2

§Krueger, Arthur F. (*Extended Forecast Section, U. S. W. B., Wash., D. C.*), **The weather and circulation of October 1954, including a discussion of Hurricane Hazel in relation to the large-scale circulation.** *Monthly Weather Review*, Wash., D. C., 82(10):296–300, Oct. 1954. 5 figs., 5 refs. **DWB, DLC**—Circulation anomalies which led to the heavy rains in the Chicago-Pittsburgh area during the second week of Oct. and to extremely high temperatures on the east coast during the first half of the month, were followed by hurricane Hazel during the 3rd week when zonal circulation changed to meridional. A strong block occurred over Eastern Siberia and S.W. Europe, and deep troughs in the Aleutians and North Atlantic. Heavy rains (20″) fell in southern Italy in 15 hrs the 3rd week of Oct. 1954. *Subject Headings:* **1. Atmospheric circulation anomalies 2. Meridional circulation 3. Hurricane "Hazel" (1954) 4. United States 5. Europe.**—*M.R.*

ATMOSPHERIC DISTURBANCES

See also: **Hurricane spiral bands** (Senn et al.), 10.2–26; **Arctic anticyclonic circulation** (Fjørtoft), 10.2–37; **Rossby regime, Australia** (Karelsky), 10.2–145; **Cyclone mechanics** (Mertsalov), 10.2–191; **Nondivergence level** (Vítek), 10.2–193; **Harmonic analysis** (Eliasen), 10.2–197; **Atmospheric circulation anomalies** (Krueger), 10.2–203; **Tropical cyclone development** (Wang), 10.2–212; **Monsoon-typhoon relationships, India** (George), 10.2–245; special bibliography on **Tornado analysis and forecasting,** p. 270.

10.2–204 551.515.2:532.59:551.46

Wiegel, R. L.; Snyder, C. M. and Williams, J. E. (*all, Univ. of California, Berkeley, Calif.*), **Water gravity waves generated by a moving low pressure area.** *American Geophysical Union, Transactions*, 39(2):224–236, April **1958.** 14 figs., table, 13 refs., eqs. **DWB, DLC**—Hurricanes (typhoons) have an intense low pressure area which often moves rapidly over the surface of the ocean. The coupled water gravity waves generated by such a moving low pressure area have been studied in a towing tank. It was found that the waves generated in this manner had a phase velocity identical to the velocity of the moving low pressure area. When the low pressure area was moving at velocities less than the shallow water wave velocity $\sqrt{gh}$, the waves were of nearly constant period. The period was that which, when considered with the water depth, would provide a wave phase velocity identical to velocity of the moving low pressure area. As the group velocity of water gravity waves is less than the phase velocity, the wave groups were formed behind the moving disturbance. If the low-pressure area is considered to be a gust, it provides a mechanism for generating "wind waves" of the period observed in the ocean if the forward speed of the gust is taken as the mean speed of the wind. When the velocity of the moving low pressure area approached $\sqrt{gh}$, the characteristics of the waves changed (at $\sqrt{gh}$ phase and group velocities become identical in the linear theory). The wave disturbance consisted of a large wave followed by a few smaller waves. After the pressure area movement was stopped, the first wave would move ahead of the tail of the disturbance, the distance between the two phenomena increasing with increasing distance traveled by the waves. For certain combinations of initial conditions, several waves were formed with this characteristic. These waves had the appearance of the records on the tide gages at certain locations of the East Coast of the U. S. during Hurricane "Carol" (and other hurricanes). A study of Hurricane "Carol," with respect to its speed of forward movement and the water depth over which it moved, showed that it should have generated waves of the type obtained in the laboratory and which were actually recorded. *Subject Headings:* **1. Hurricane generated sea waves 2. Water gravity waves 3. Low pressure effects on ocean waves 4. Ocean wave periods 5. Hurricane "Carol"** (1954).—*Authors' abstract.*

10.2–205 551.515.2

Yamashita, R., **A theoretical study of tropical cyclones.** *Meteorological Society of Japan, Journal*, Ser. 2, 34(1):11–23, March **1956.** 3 figs., 4 tables, 62 eqs. **DWB, DLC**—The author shows dynamically that a cyclone can be maintained by the latent heat of condensation and calculates the values of the elements, i.e., the wind velocities, the temperature deviation and

that of the pressure, when the intensity of precipitation is given. The results do not greatly contradict the observational common knowledge, and several characteristic properties of actual cyclones are well understood by the author, though he has treated an ideal case on the assumption that the elements are expressed by one cylindrical function with respect to r. In the next, he gets the graphs of the whirlwind and the pressure which correspond considerably to ordinary records of tropical cyclones by a simple theory. The discussion of cyclones due to surface heating in the 2nd paragraph is only intended for the convenience of comparison with the subject problem. Typhoons may possibly originate from them. *Subject Heading:* **1. Tropical cyclone theories.**—*Author's abstract.*

10.2–206 551.515.3:699.8

Reynolds, George W. (*Engineering Res. Inst., Univ. of Michigan*). **Venting and other building practices as practical means of reducing damage from tornado low pressures.** *American Meteorological Society, Bulletin*, 39(1):14–20, Jan. **1958.** 4 photos, 2 tables, 29 refs. **DWB, DLC**—Estimates of the pressure reduction in the tornado vortex run up to one-half an atmosphere. The greatest officially reported pressure drop associated with tornadoes has been 0.65 in. (mercury). There is an unofficially reported drop of around five in. No one can say what the maximum pressure gradient in a tornado is. It is believed that a venting area of one square foot per 1000 cubic ft of air space should be enough to reduce to a safe level the pressure gradient that most buildings will experience in tornadoes. It is also believed that anchorage of the building to the foundation, anchorage of the roof to the building, and better connections at corners will make a house strong enough to resist most tornado forces successfully. *Subject Headings:* **1. Venting 2. Tornado resistant construction.**—*Author's abstract.*

10.2–207 551.515.31:551.594.2

Vonnegut, Bernard, **Electrical theory of tornadoes.** Arthur D. Little, Inc., Contract Nonr-1684(00), Partial Final Report, No. 4, May 21, **1956.** 45 p. 13 figs., 43 refs., 9 eqs. **DWB** (M15.3 V947e)—A novel theory, or rather one which was current from the time of LUCRETIUS (50 B.C.) to the 19th century, is revived and given a basis in modern concepts of tornado structure and electrical activity associated with its funnel. Reasoning from the observed fact that electrical activity is much greater (e.g., lightning flashes every second or more often) in the funnel area, the author deduces that the funnel provides a preferred path for discharges (greater ionization, lower pressure, etc.), and as a result becomes heated far more than the surrounding area, thus providing the energy for maintaining the tremendous wind speeds known to occur in tornadoes. Numerous graphic models are presented to show known or hypothesized mechanisms. Also, some quantitative calculations of energy budgets based on assumption that each and every discharge in a tornado is as powerful as a normal 5 km lightning stroke, are made. *Subject Headings:* **1. Electrical theory of tornadoes 2. Tornado theories.**—*M.R.*

10.2–208 551.515.4:551.55

Foster, Donald S. (*U. S. Weather Bur. Kansas City, Mo.*). **Thunderstorm gusts compared with computed downdraft speeds.** *Monthly Weather Review*, Wash., D. C., 86(3):91–94, March **1958.** 4 figs., 8 refs., 4 eqs. **DWB, DLC**—The buoyancy equation is integrated to find the downward speed of a parcel of air that becomes cooler than its environment and sinks to the ground, such as a downdraft in a thunderstorm. This downdraft speed is related to the positive energy area on a thermodynamic diagram. From a sample of one hundred soundings taken just prior to thunderstorm occurrences, a correlation coefficient of 0.50 is obtained for the computed downdraft and measured wind gusts. Taking the upper wind speed into account fails to improve significantly the correlation coefficient. A correlation coefficient of only 0.21 is obtained for the direction of the surface wind gust and the wind direction in the 700–500 mb layer. *Subject Heading:* **1. Thunderstorm gusts.**—*Author's abstract.*

10.2–209 551.515.4:551.593(492) 551.594.2

—Netherlands. Meteorologisch Instituut. **Onweders, optische verschijnselen, enz. in Nederland: naar vrijwillige waarnemingen.** [Thunderstorms, optical phenomena, etc. in the

Netherlands: voluntary observations.] Vol. 1, 1880(?)– Latest issue seen, Vol. 72, 1951. Pub. 's-Gravenhage, 1955. figs., tables. (Its *Pub.* No. 81.) **DWB** (M82.1/192 N469o)—Each annual report gives tabular and textual data on all manner of miscellaneous phenomena reported by about 150 cooperative weather stations in the Netherlands. Station location maps and index, detailed tabulations of thunderstorms by months compared with long period averages, data on hail, waterspouts or tornadoes, ball lightning, St. Elmo's fire, halos, auroras, nacreous and noctilucent clouds, rainbows and other similar phenomena are presented separately and discussed in chronological order under each major heading. (For 1944 issue, see 2.5–182, May 1951, *MAB.*) *Subject Headings:* **1. Thunderstorm data 2. Optical phenomenon data 3. Auroral data 4. Netherlands.**—*M.R.*

10.2–210 551.515.4:551.558.1

Rein, Frantiseˇk, **Vztah mezi vertikálními pohyby a bouřkami.** [Relation between vertical movement and thunderstorms.] *Meteorologické Zprávy*, Prague, 10(5):119–125, 1957. 12 figs., 2 tables, 9 refs., 5 eqs. Russian and English summaries p. 119. **DWB**—The paper contains the results of a preliminary study of the relation between the pattern of the vertical isotachs (of the order of cm/sec) and the occurrence of thunderstorms or convective cloudiness. Both the synoptic vertical velocities, as well as those enforced by the flowing of air over mountains, are considered. It is shown that in several cases the forced vertical motions considerably influence the distribution of synoptic vertical motions; hence the forced motions should not be neglected. The statistical relation between the occurrence of thunderstorms and medium vertical velocities (in cm/sec) of the lower troposphere is shown graphically and in several specific examples. *Subject Headings:* **1. Thunderstorm-vertical motion relationships 2. Vertical velocities.**—*Author's abstract.*

10.2–211 551.589.1:551.515.7(74/77)

*Korshover, Julius (*Spec. Proj. Sec., U. S. W. B., Wash., D. C.*), **Synoptic climatology of stagnating anticyclones east of the Rocky Mountains in the United States for the period 1936–1956.** Wash., D. C., U. S. Weather Bureau, [1957]. 4 p. 6 figs., 3 tables, 8 refs. **DWB** (M15.7 U587syn)—In an attempt to define the synoptic climatology of stagnant highs in the eastern U. S., all such cases from 1936–56 on the U. S. W. B. daily sea level weather maps were analyzed to determine areas (to 1° square) of stagnation (eliminating frontal or precipitation coincidence as destroying air pollution in stagnant masses). Only warm anticyclones (reaching high altitudes) qualified with respect to stagnation. A catalog of such cases arranged chronologically, and a duration frequency table by months, plus charts showing geographic distribution of total number of cases and days, a graph of annual variation of frequency of cases of 4, 5, 6 and 7 or more days, and areal frequency maps for each month, showing greatest frequency of cases in Oct. (>14 cases of 4 days or more) over western North Carolina and northern Georgia, and >10 days in May and Sept. in southern Carolina and eastern Pennsylvania, respectively, are presented. *Subject Headings:* **1. Synoptic climatology of stagnant anticyclones 2. Stagnant anticyclone frequencies 3. Eastern United States.**—*M.R.*

10.2–212 551.515.8:551.515.21

Wang, S. D., **A study of the influence of polar outbreaks upon the development of tropical cyclones.** *Meteorological Bulletin*, Taipei, Formosa, 3(4):9–15, Dec. **1957.** 7 figs., table, 6 refs. In Chinese; English summary p. 9. **DLC** (Orientalia)—This paper gives climatic and synoptic research on the development of tropical cyclones when they happen to meet with the outbreaks of polar air in Siberia. Their trajectories were grouped into three main types. Each pattern of these synoptic pictures is introduced as an example to demonstrate the change of characteristics of tropical cyclones resulting through the influence of polar air outbreaks. *Subject Headings:* **1. Tropical cyclone development 2. Polar outbreaks.**—*Author's abstract.*

10.2–213 551.515.83(498):551.509.3

Bacinschi, D., **Un caz tipic de frontoliză.** [A typical case of frontolysis.] *Meteorologia şi Hidrologia*, Bucharest, 2(1):76–79, Jan./March **1957.** 5 figs. **DWB**—A typical case of frontolysis occurred over Romania on Aug. 22, 1956. Its development is described and

illustrated by means of surface and upper air charts, a vertical section of air mass modification, and temperature and precipitation data. *Subject Headings:* **1. Frontolysis 2. Synoptic studies 3. Romania.**—*G.T.*

10.2–214 551.515.83(4):551.513

Seidel, Gerhard, **Die Zirkulation über Europa als Folge von Kaltluftbewegungen über der westlichen Hemisphäre.** [Circulation over Europe as a consequence of cold air movements over the Western Hemisphere.] *Germany. Deutscher Wetterdienst, Berichte*, No. 34, **1957.** 19 p. 19 figs., 4 tables, 21 refs. **DWB**—The winters 1954–55 and 1955–56 indicate that a maximum of cold air over the Western Hemisphere is followed by a minimum zonal circulation over Europe and vice versa. The extremes are 5–7 days apart. For western cold there seems to exist a threshold value serving as a criterion for deciding whether cyclonic or anticyclonic development is in prospect for Europe. These results are formulated as a rule, which was subsequently tested by the winters of 1954–55 and 1955–56. Tests of other winters and similar results that this is not random phenomenon in the winters were investigated. It is related probably to warm and cold air movements which are produced while moving from west to east—and compensated. The initial onset appears to originate from the warm air. *Subject Headings:* **1. Cold air movements 2. Zonal circulation 3. Europe.**—*Trans. of author's abstract (I.L.D.).*

RADIATION AND TEMPERATURE

RADIATION

See also: **Cosmic ray variations** (Dorman), 10.2–10; **Solar radiation-air conditioning, Calcutta** (Groundwater), 10.2–24; **Bibliog. on natural sources of energy,** 10.2–27; **Solar radiation measurements, Arctic Ocean** (Fritz), 10.2–36; **Solar water heaters** (De Bremaecker), 10.2–105; **Radio brightness distribution** (Hagen), 10.2–110; **Radio wave reflection from moon** (Kerr et al.), 10.2–111; **Stellar radio radiation** (Ellis, Newstead), 10.2–112; **Radio telescopes** (Head), 10.2–113; **Beryllium^{-10} production by cosmic rays** (Arnold), 10.2–114; **Sea level penetrating particles** (Chang et al.), 10.2–115; **Sea level mesons** (Chang), 10.2–116; **Cosmic ray showers** (Cranshaw et al.), 10.2–117; **Cosmic ray electron spectrum** (Daion), 10.2–118; **Cosmic ray showers** (Dovzhenko et al.), 10.2–119; **Cosmic ray theories** (El-Mofty, E.-Nadi), 10.2–120; **Cosmic ray production energy** (Guzhavin, Zatsepin), 10.2–121; **Cosmic ray paths** (Lüst et al.), 10.2–122; **Seasonal variation of radiational temp.** (Otani), 10.2–225; **Quivering of leaves at twilight** (Zamorskiĭ), 10.2–226; **Auroral and airglow spectroscopy, Saskatoon** (Hunten), 10.2–340.

10.2–215 551.521.18:551.593.1

Schlueter, Donald J. (*Kansas Univ.*) and Peck, Edson, R. (*Northwestern Univ. Evanston, Ill.*), **Refractivity of air in the near infrared.** *Optical Society of America, Journal*, 48(5):313–315, May **1958.** 3 tables, 9 foot-refs., 4 eqs. **DLC**—Recent measurements made at Northwestern Univ. in 1957 are reported for the refractive index of air in the infrared up to 2 microns. These are both absolute and relative in nature, the latter being more precise. It is concluded that the measurements support the validity of Edlen's refractivity formula in this region. *Subject Heading:* **1. Refractive index in infrared.**—*Authors' abstract.*

10.2–216 551.521.3:551.571.7

Regula, Walter, **Das Spektrum des Wasserdampfes.** [The spectrum of water vapor.] *Germany. Deutscher Wetterdienst, Berichte*, 6(44), **1958.** 19 p. 9 figs., 8 tables, 63 refs. **DWB, DLC**—After an introduction on the material and electric structure, and the 6 degrees of freedom or rotation and vibration of the water molecule, the whole absorption of water vapor between 1.35 cm and 300 Å is described. The treatise stresses the spectral distribution of the absorption and intentionally not its intensity. The rotation-, the vibration-rotation-, and the ultra violet band-spectra, including the theory of its origin, are treated separately. The selection rules of the allowed transitions, most of the rotational energy levels, numerous rotation lines, all bands and vibration quantum numbers known up to now, regions of continuous absorption, the energies and products of ionization are put down. The selection rules render

ossible some essential statements on the emission spectrum and, connected with the theory specific heat, the direction of transformation of radiative energy. The spectral displacement the absorption at the transition from vapor to liquid water and ice is skirted. *Subject eading:* **1. Water vapor spectroscopy.**—*Author's abstract.*

10.2–217 551.521.32:551.521.18

*Larmore, Lewis (*Lockheed Aircraft Corp., Van Nuys, Calif.*), **Transmission of infrared diation through the atmosphere.** *IRIS Proceedings* (Pub. by the U. S. Naval Ordnance ab., Corona, Calif.), 1(1):14–23, June **1956.** 2 figs., 6 tables, 5 eqs. Appended: Passmann, dney and Larmore, Lewis, **Correction to atmospheric transmission tables.** p. 15–17, *Ibid.* olume and number not known). 2 tables, 4 refs. both photostat of separated pages. **DWB** M21.61 L324t)—Absorption of infrared radiation by water vapor, CO_2, O_3, is discussed id illustrated, and tables presented for calculation of various parameters of absorption and ansmission in bands from 0.3μ to 7.0μ and for amounts of precipitable water of .01 cm to)° cm or for CO_2 path length of 0.1 km to 1,000 km. Altitude correction for H_2O and CO_2 re also given for 1000 to 100,000 ft, etc. *Subject Headings:* **1. Infrared absorption of water apor 2. Infrared transmission calculations 3. Infrared absorption of carbon dioxide Infrared absorption of ozone.**—*M.R.*

10.2–218 551.521.326

Barbier, D., **The airglow.** (In: Beer, Arthur (*ed.*), **Vistas in astronomy.** London, ergamon, **1955.** Vol. 2:929–939. numerous refs.) **DLC** (QB3.B35). Also issued as *nstitut d'Astrophysique de Paris, Contributions, Ser. B,* No. 108. **CU, NNA**—The status of ne problem of the airglow is reviewed; the observational point of view is particularly empha- zed. The author examines successively the instruments, the spectrum of the nightglow, the eights of airglow emissions, the temperatures of the emitting layers, the absolute intensities f the nightglow radiations, the polarization of the nightglow lines, the seasonal variations of ightglow intensity, the theoretical interpretation and the twilight glow. *Subject Headings:* **Night airglow 2. Seasonal airglow variations.**—*Author's abstract.*

10.2–219 551.521.326:546.33:535.33

Chamberlain, J. W.; Hunten, D. M. and Mack, J. E. (*U. of Chicago; U. of Saskatchewan; U. of Wisc., resp.*), **Resonance scattering by atmospheric sodium, Pt. 4, Abundance of sodium n twilight.** *Journal of Atmospheric and Terrestrial Physics,* London, 12(2/3):153–165, **1958.** figs., 3 tables, 18 refs., 11 eqs. **DLC**—The theory of Pt. I is extended to take account of the yperfine structure of the D-lines. The absolute intensity of D_1+D_2 and the ratio of D_2/D_1 re computed as functions of total Na abundance for an angle of solar depression, β, of 6.5°.)bservations made in Saskatoon are discussed in terms of the seasonal variation of Na. Abun- ance determinations from the D_2/D_1 ratio in twilight and from the terrestrial component of)-line absorption in the solar spectrum are in good accord with abundances deduced from the bsolute twilight intensity. *Subject Headings:* **1. Sodium D line 2. Sodium absorption . Twilight sodium spectrum.**—*Authors' abstract.*

10.2–220 551.521.326:552.6

Jones, A. Vallance (*Physics Dept., Univ. of Saskatchewan, Saskatoon*), **Calcium and oxygen n the twilight airglow.** *Annales de Géophysique,* Paris, 14(2):179–185, April/June **1958.** figs., 11 refs. French and English summaries p. 179. **DLC**—The results of a study of the ppearance of Ca II lines in the twilight airglow spectrum, made during the summers of 1955, 956 and 1957 are presented. The appearance of the lines has been found to be independent f auroral activity; some indication of a correlation with meteor showers has been established. he absolute brightness of the emission in the zenith has been found to be 150 R (allowing or atmospheric extinction). The observed absolute brightness is not inconsistent with the upposition that the calcium originates from the debris of meteor trains. The appearance f the 0.1 $^1\Delta_g - {}^3\Sigma_g^-$, O_2 band at 1.58μ in the twilight airglow spectrum as a result of a resonance hosphorescence excited by solar radiation is reported briefly and a reference is given to a etailed treatment in a paper [10] which is now in the course of publication. *Subject Headings:* **. Twilight airglow 2. Meteor showers 3. Phosphorescence resonance.**—*Author's abstract.*

10.2–221 551.521.326:546.33:535.33

Jones, A. Vallance and McPherson, D. H. (*U. of Saskatchewan, Saskatoon*), **The seasonal variation of the intensity ratio of the D-lines in twilight.** *Journal of Atmospheric and Terrestrial Physics*, London, 12(2/3):166–170, **1958.** 2 figs., 2 tables, 6 refs. **DLC**—The intensity ratio of the sodium D-lines in twilight has been measured over the period from May 1955 to July 1956 from photographic spectra obtained with an auroral spectrograph having a dispersion of 30 Å/mm. Significant variations of the D_2/D_1 line ratio were found, ranging from a mean value of 1.40 ± 0.08 for the period from Dec. to Feb. to a value of 1.67 ± 0.20 for the period from May to June. The abundances of sodium calculated from these ratios are in agreement with abundances calculated from the absolute brightness and the direct absorption methods. The measurements are in good agreement with the theoretical calculations of Chamberlain, Hunten and Mack (1957). *Subject Headings:* **1. Sodium D line emission 2. Twilight sodium spectrum 3. Sodium emission variations.**—*Authors' abstract.*

10.2–222 551.521.326:551.593.1

Roach, F. E.; Megill, L. R.; Rees, M. H. and Marovich, E. (*Nat'l Bur. Stan. Boulder Lab.*), **The height of nightglow 5577.** *Journal of Atmospheric and Terrestrial Physics*, London, 12(2/3):171–186, **1958.** 5 figs., 12 tables, 13 refs., 7 eqs. **DLC**—An analysis is given of observations of nightglow 5577 during twelve nights at Fritz Peak, Colo. A new photometer with a birefringent filter effectively eliminates light of astronomical origin. The heights deduced from the systematic increase of the nightglow intensity toward the horizon depend critically on the scattering and extinction of the lower atmosphere. It is found that, if a constant extinction coefficient is used in the reductions for all the nights, the spread in deduced heights is from 51 to 136 km with 100 km as the mean value. A more probable interpretation is that the actual height is 100 km and that the extinction coefficient varies from night to night. For an entire night of data the uncertainty in the extinction coefficient produces the largest error in the deduced height. On the other hand, at a given instant the spottiness of the sky is the predominant source of error. *Subject Headings:* **1. Night airglow layer heights 2. Extinction coefficient 3. Fritz Peak, Colo.**—*Authors' abstract.*

10.2–223 539.19:551.521.64

Fenton, A. G.; Fenton, K. B. and Rose, D. C., **The variation of sea level cosmic ray intensity between 1954 and 1957.** *Canadian Journal of Physics*, Ottawa, 36(7):824–839, July **1958.** 7 figs., 2 tables, 11 refs. **DWB, DLC**—Results from neutron monitors and meson telescopes at Ottawa (geomag. lat. 57°N) and Resolute (geomag. lat. 83°N) are presented for the years 1954–57, a period of increasing solar activity. The results indicate that the sea level meson intensity at these latitudes decreased by 5–6% between April 1954 and Dec. 1957. During the same period the intensity of the nucleonic component at these stations decreased by over 22%. Investigation of the relative response of the two types of recorder to transient decreases during this period indicates that the long term change in the intensity level cannot be explained completely as an accumulation of shorter transient decreases, which become more frequent at times of higher solar activity. It is concluded that the transient decreases are superimposed upon the longer term changes, each being produced by a separate modulation process but ultimately controlled by the general level of solar activity. Significant differences are found in the shape of transient decreases observed at the Canadian stations both between different components at the one station and the same component at different stations. These may be interpreted as due to a varying energy dependence from one transient decrease to another, and to anisotropy in the primary cosmic radiation at these times. *Subject Heading:* **1. Cosmic ray variations.**—*Authors' abstract.*

10.2–224 551.521.67:629.396.8

Komesaroff, M. (*Div. of Radiophysics, C.S.I.R.O. Univ. Grounds, Chippendale, N.S.W.*), **Polarization measurements of the three spectral types of solar radio burst.** *Australian Journal of Physics*, Melbourne, 11(2):201–214, June **1958.** 6 figs., 2 tables, 8 refs., eqs. **DLC**—A swept-frequency technique was used for measuring the polarization of solar radio bursts occurring at the beginning of the present sunspot cycle. Of special interest were the results for bursts of spectral type III. Contrary to the inference drawn from earlier work, it was

und that many of these bursts are highly polarized. Furthermore, there were strong in-cations that the polarization is produced at the radiation source and is not imposed by opagation conditions in the overlying media. *Subject Headings:* **1. Solar radio noise bursts Solar radio noise burst polarization.**—*Author's abstract.*

TEMPERATURE

See also: **Temp. of Eichstätt, Bavaria** (Menzl), 10.2–23; **Aeroclimatology of the Ukraine, U.S.S.R.** (Kravtsova), 10.2-29; **Arctic temp. data** (Flohn, Seidel), 10.2–38; **Fuel requirements** (Crow), 10.2–101; **Cooling degree days, U. S.** (Thom), 10.2–103; **Superadiabatic lapse rates, Hilo, Hawaii** (Hodge), 10.2–185; **Thermal balance of water surfaces** (Samochkin), 10.2–190.

10.2–225 551.524.7:551.521.2(52)

Otani, K. (*Nagoya Local Met. Obs.*), **Seasonal variation of the radiational temperature ange in the troposphere near Japan.** *Geophysical Magazine*, Tokyo, 27(4):543–548, Dec. 56. 4 figs., 2 tables, 7 refs., 2 eqs. **DWB, DLC**—Seasonal variation of the distribution the radiational temperature change in the troposphere near Japan is examined in the case clear skies, using the monthly mean data of the upper soundings at six stations. The frared flux and the flux divergence due to water vapor and carbon dioxide are computed aphically by YAMAMOTO's radiation chart. The absorption of insolation by water vapor also computed from YAMAMOTO's absorption chart. Then the net heat loss is determined y method of finite difference. It is shown that the atmosphere tends to cool everywhere, far as the radiative processes are concerned, and the net cooling amounts to: 0.6–1.8°C r day in winter, 1.0–1.6°C per day in summer. It is also shown that the net cooling tends decrease the vertical temperature gradient in winter, but the case is reverse in summer. *ubject Headings:* **1. Radiational cooling variations 2. Radiation balance 3. Japan.**—*Author's stract.*

10.2–226 551.524.3:551.511.33:551.521.2

Zamorskiĭ, A. D., **Vechernee drozhanie list'ev.** [Evening quivering of leaves.] *Priroda*, loscow, 44(12):108–109, Dec. **1955. DLC**—The unusual phenomenon of quivering of grass id the tree leaves (from dusk to darkness), observed several times by the author during clear id calm summer evenings, is described and given a meteorological explanation. The calming own of the wind in the evening is connected with the cooling of the lowest air layer due to its ntact with the radiational cooling of the earth's surface. In the case of vegetation, it is ie upper portions of grass and the tree tops that lose the most heat. Convective air currents evelop between the relatively warm earth's surface and the colder surface of the leaves. hese currents attain their maximum at the beginning of the night (greatest temperature radients). Judging by the intensity of the quivering, it can be assumed that the kinetic nergy of these currents is rather large. The meteorological significance of this process nsists of heat exchange between soil and air by means of development of streams, or by the shaking off" of cold air from the leaves. *Subject Headings:* **1. Radiational cooling 2. Convective current 3. Quivering of leaves at twilight 4. Soil-air heat exchange.**—*A.M.P.*

10.2–227 551.524.3:551.511.33:551.551

Malkevich, M. S., **Izmeneniia temperatury vozdukha so vremenem pod vliianiem turulentnogo peremeshivaniia i luchistogo teploobmena.** [Temporal temperature variations nder the influence of turbulent mixing and radiative heat exchange.] *Akademiia Nauk SSR. Geofizicheskiĭ Institut, Trudy*, No. 37(164):102–119, **1956.** 2 figs., table, 8 refs., 3 eqs. **DLC**—The variation of given distributions of atmospheric temperature is investigated taking into account the heat exchange in the soil, turbulent heat transfer and radiational eat exchange. A two stage problem is solved for the atmosphere: in the atmospheric layer ear the ground there is a variable coefficient of temperature conductivity (a linear function height) but constant air and water vapor density; in the free troposphere this coefficient ecomes constant but the density varies with light according to an exponential law. It is own that in the boundary air layer (2–3 km) the variations of temperature are determined

fundamentally by the heat influence of the underlying surface and by turbulent mixing. Outside of the boundary layer the variations of temperature are chiefly the result of radiational heat exchange. *Subject Headings:* **1. Temperature variations 2. Turbulent transfer of heat 3. Radiation heat exchange 4. Soil-air heat exchange.**—(*Trans. of author's abstract*).

10.2–228 551.524.32(468.1)

*Due Rojo, Antonio (*Dir. Cartuja Obs.*), **El régimen térmico estival en Granada.** [The summer heat regime of Granada.] *Granada. Observatorio de Cartuja, Publicaciones, Ser. B*, No. 60, **1955.** 9 p. 2 figs., 2 tables. **DWB.** Reprinted from *Real Sociedad Geografica, Publicaciones, Ser. B*, No. 347, (**1955?**).—The author defines the normal summer day as that on which the maximum diurnal temperature is equal to or greater than 30°C—severe summer when the temperature exceeds 35°C and tropical when the minimum temperature exceeds or is equal to 25°C. On the basis of these definitions, fifty years of hourly temperatures observed at the Observatorio de Cartuja are analyzed statistically in order to characterize the summer of Granada. Graphs and tables show number of days of summer for each year during the period 1903–1952 and the summer coefficients for the same period. The latter are calculated by this formula:

$$C_i = \frac{T_i}{T_m}\frac{1}{2}\left(\frac{V_i}{V_m} + \frac{R_i - C_i}{R_m}\right) = \frac{T_i}{91.6}\frac{1}{2}\left(\frac{V_1}{93.3} + \frac{V_1 - C_i}{37.0}\right)$$

where T_m—50 year mean temperature of the four months June to Sept., T_i—mean temperature for the same months for each individual year, V_m—mean of summer days of summers for 50 years, R_m—the mean of severe summer days and V_1 and R_i—the mean of each year, respectively. *Subject Headings:* **1. Summer temperatures 2. Temperature regime 3. Granada, Spain.**—*I.L.D.*

10.2–229 551.524.36:551.513

Maede, Hans, **Über einige Beziehungen zwischen der Lage des Kältepols und der Zirkulation über Mitteleuropa, II. Teil, Nichtgleichzeitige Beziehungen.** [Some relations between the position of the cold pole and the circulation over Central Europe, Pt. 2, Non-simultaneous relations.] *Zeitschrift für Meteorologe*, Berlin, 11(5/6):161–177, May/June **1957.** fig., 13 tables, 13 refs. **DWB, DLC**—In Pt. I (*See* 8.2–171, Feb. 1957, *MAB*), a study of the simultaneous relationship between the daily cold pole determined from the relative topography 500/1000 mb over one of five selected areas (North Pole, Canadian Archipelago, North America, Greenland and Spitsbergen, Northeast Europe) and the flow aloft at 500 mb or the height of the 500 mb surface over Central Europe and of seven European large scale weather types was made. In this study the relationships between the corresponding magnitudes are investigated, in particular on test days and on subsequent days. It is assumed that the position of the cold pole is the cause of the changing Central European magnitudes. The methods employed in this study include analysis of the mean frequency of Central European large scale weather types during the four seasons on the seventh day following a test day. Study of the positions of the centers of specific cold poles, analysis of the weather over central Europe as a function of the cold pole, and analysis of the persistence and reversal of large scale weather types. When the cold pole is situated over the geographical North Pole, then Central Europe experiences subnormal zonal circulation in winter and spring and above normal zonal circulation in summer and fall. Also, specific typical developments follow a Canadian cold pole during winter and spring. During initially frequent blocking situations after transitory high pressure situations, a North American situation causes subsequently a zonal circulation. After a winter cold pole situation over eastern Europe, there occurs a reversal to cyclonic S to W weather; while during the summer, transitions of weather types with northern components to those with southern components are the most frequent. *Subject Headings:* **1. Cold pole 2. Atmospheric circulation 3. Large scale weather processes 4. Central Europe.**—*Author's abstract and I.L.D.*

10.2–230 551.524.36

*Thom, E. C. (*Climatological Services Div., U. S. W. B., Wash., D. C.*), **What will the winter be in New York City?** *U. S. Weather Bureau, Weekly Weather and Crop Bulletin*, 42(47):7

ov. 21, 1955. table. **DWB**—A weather study of heating degree data for New York Central ark was made for 77 yrs (Nov. 1887 through Feb. 1955). Significant relationships have been und between the total number of degree days in Nov. and the departure from normal of the rresponding total for the succeeding 3 month period. November average totals were 598 id the winter-season average was 2894 heating degree days as normals for analysis. Two iarts are supplied. *Subject Headings:* **1. Degree day data 2. Long period records 3. New ork City, N. Y.**—*N.N.*

10.2–231 551.524.37:551.513

§O'Connor, James F. (*Extended Forecast Section, U. S. W. B., Wash., D. C.*), **The weather id circulation of January 1958: low index with record cold in Southeastern United States.** *Monthly Weather Review*, Wash., D. C., 86(1):11–18, Jan. 1958. 8 figs., 4 refs. **DWB, DLC**—t least 7 active cold fronts hit Florida, bringing heavy rains and even snow in northern and ntral parts. Citrus production was lowered by millions of boxes and tree damage was cessive. On the other hand, Glasgow, Mont. had the only Jan. on record with no subzero ') temps. and at Meacham, Oreg. it was warmest Jan. on record. Various features of the eneral circulation index cycle, cyclone and anticyclone tracks and characteristics of individual orms, temp. and precip. and, finally, the conditions in the tropical Pacific, are discussed and ipported by charts, graphs and maps. *Subject Headings:* **1. Record cold winters 2. Cold aves, Florida (Jan. 1958).**—*M.R.*

10.2–232 551.524.4:551.584.2

†*Austin, James M.; Noonkester, Virgil; Glass, Morton and Thomasell, Albert, **Low-level versions.** Massachusetts Institute of Technology. Dept. of Meteorology, Contract DA)-129-QM-377, Final Report, Sept. 30, 1957. 153 p. 18 figs., 29 tables, 57 refs., eqs. **DWB** M24.4 M414Lo)—A study of the properties and behavior of low level inversions was initiated ecause of their importance in the development of "local climate." In particular, the effect the presence of various types of inversions on temperature change was explored. Average alues of inversion height and intensity and the percentage frequency of occurrence of inversion pes with weather and wind direction were tabulated for both summer and winter at six idely scattered stations over the U. S. Average daytime and night-time temperature changes ith respect to inversion type and weather were computed. An attempt was made to specify version types by means of the large scale pressure pattern and its change. This investigation, hich employed the methods of synoptic climatology developed by T. F. MALONE, showed that iere was no unique relationship between the pressure pattern and the inversion type. Also ie occurrence of a low level inversion not related to either the station pressure or its change. was concluded from the large number of inversions observed that the presence of low level versions over land is a normal condition. Temperature change during the day in winter as found to depend upon inversion type, but at night the degree of dependence was slight. t three selected stations local climate was found to be different in the presence and absence a ground inversion as indicated by the minimum and maximum temperatures and the urnal temperature range. An objective method of predicting temperature change and version modification, using area on an equal-area energy diagram as a measure of intensity, proposed. *Subject Headings:* **1. Low level inversions 2. Inversion effects on local climate.** *-Authors' abstract.*

SOIL TEMPERATURE

See also: **Quivering of leaves at twilight** (Zamorskiĭ), 10.2–226.

10.2–233 551.525

Bark, L. D. (*Climatological Services Div., U. S. W. B.*), **Temperature of the soil.** *U. S. Weather Bureau, Weekly Weather and Crop Bulletin*, 42(50):7–8, Dec. 12, 1955. **DWB**—limate affects every plant's growth and development. Two figures giving data on the diurnal id seasonal variations in soil temperatures to 10 m depth have been furnished by the Uni-ersities of Maryland and Washington (state), respectively. Soil temperature does not emonstrate as rapid variation with time as does air temperature. *Subject Headings:* **1. Diurnal**

soil temperatures variations 2. Seasonal soil temperature variations 3. Soil temperatures 4. Maryland 5. Washington (State).—*N.N.*

10.2–234 551.525.5

Brewer, Max C. (*U. S. Geological Survey, Menlo Park, Calif.*), **Some results of geothermal investigations of permafrost in northern Alaska.** *American Geophysical Union, Transactions* 39(1):19–26, Feb. **1958.** 10 figs., table, 4 refs. **DWB, DLC**—Frequent, regular thermal measurements in northern Alaska over a six-year period have provided information on many of the problems related to the temperature and distribution of permafrost in the Arctic. The maximum depth of permafrost near Barrow is 1330 ft. The minimum permafrost temperature recorded, below the depth of measurable (0.01°C) seasonal fluctuation (70 to 100 ft), is −10.6°C. The temperature effect of medium-sized (40 by 100 ft) heated buildings resting on permafrost is measureable to depths well below 50 ft. It is doubtful that frozen ground at shallow depths extends outward more than a few tens of feet from the shore of the Arctic Ocean although it may be present at depths greater than 100 ft. Lakes deeper than about seven feet do not freeze to bottom and may have an unfrozen zone approaching several hundred feet in depth beneath them. *Subject Headings:* **1. Permafrost distribution 2. Permafrost temperatures 3. Northern Alaska.**—*Author's abstract.*

WATER TEMPERATURE

See also: **Thermal balance of water surfaces** (Samochkin), 10.2–190; **Pleistocene temp., Caribbean** (Yalkovsky), 10.2–312.

10.2–235 551.526.6:551.50

Urick, R. J.; Pharo, L. C. and Skudrzyk, E. (*all, Ordnance Res. Lab., Penn. State Univ. Penn.*), **A new method for measuring the thermal microstructure of the sea.** *American Geophysical Union, Transactions*, 39(2):237–240, April **1958.** 5 figs., 7 refs. **DWB, DLC**—Previous measurements of the small scale temperature structure of the sea have involved a sensitive thermal device carried through the water by a ship or submarine. The present method permits microthermal measurements to be made from a stationary or slowly drifting vessel by means of temperature elements held in a fixed position along a bar. Nine thermistor beads were spaced at varying distances along a 12-ft bar, and the temperature difference between successive pairs of elements was measured by means of a bridge circuit and a sensitive dc amplifier. The records obtained lead to a simple method for determining the correlation function of temperature describing the space distribution of the temperature changes. A limited number of measurements was made in the waters off Key West, Fla., in conjunction with a field study of the fluctuation of sound transmission in the sea. The spatial and thermal scales of the microstructure are in rough agreement with the Kolmogorov theory of turbulence and they lead to a prediction for the variability of sound transmission that agrees approximately with the field measurements. *Subject Headings:* **1. Sea temperature measurement technique 2. Sea water microthermal measurements 3. Key West, Fla.**—*Authors' abstract.*

PRESSURE AND WIND

PRESSURE

See also: **Microbaric waves, Shionomisaki, Japan** (Yamamoto), 10.2–236; **Upper air wind-pressure correlation** (Hutchings), 10.2–250.

10.2–236 551.541:551.54

Yamamoto, Ryozaburo (*Met. Res. Inst. Kyoto Univ.*), **Study of the microbaric waves (II) Pt. 1, Theory of the microbarographic waves.** *Meteorological Society of Japan, Tokyo, Journal* Ser. 2, 34(5):235–243, Oct. **1956.** English summary p. 235. 8 figs., 15 refs., 20 eqs. Also his: **Study of the microbarographic waves (II), Pt. 1, Theory of the microbarographic waves** [continued, i.e. Pt. 2]. *Ibid.*, 34(6):321–326, Dec. **1956.** 4 tables, 15 refs., eqs. English summary p. 321. Also his: **Study of the microbarographic waves (III), Pt. 2, Verification**

the various theories by observation. *Ibid.*, 35(1):26–36, Feb. **1957.** 7 figs., 17 tables, 12 fs., eqs. Also his: **A study of the microbarographic waves (IV), Pt. 3, A statistical investigation of the waves.** *Ibid.*, 35(1):37–44, Feb. **1957.** 5 figs., 9 tables, 14 refs., eqs. **DWB, LC**—The equation of frequency of the atmospheric internal gravitational waves in model two layers, each of which has uniform wind speed and temperature lapse rate, with or without scontinuity of temperature itself, is derived, in order to study the mechanism of microrographic waves or pressure oscillations with period from a few to about 20 min. The uation is graphically solved and the explicit solutions of cellular and noncellular types are btained. In Pt. 2, a microbarographic observation at three points near Shionomisaki was rried out, to obtain data of the microbarographic waves available for testing the modern arious theories of the waves. Three available examples obtained by this project were, together with a classical example by ALI and four recent ones by MUNK and GOSSARD, submitted r the test. It may be concluded that almost all the observed microbarographic waves belong the stable type and not to the unstable one, from the fact that almost all the observed data tisfy the frequency equation. We could not draw any definite conclusion to judge the arious theories of predominancy of the waves. In Pt. 3, the microbarographic waves recorded three-point simultaneous observations near Shionomisaki for two years are statistically vestigated from various standpoints, taking account of the upper-air data and the natures the wave propagation. *Subject Headings:* **1. Microbaric waves 2. Shionomisaki, Japan.**—*uthor's abstract.*

10.2–237 551.543:551.513.1

Senn, Harry V. and Bryson, Reid A., **Preliminary report on the Lorenz integrated wave umber.** Wisconsin, Univ. Dept. of Meteorology, Contract AF 19(604)-992, Scientific eport, No. 5, Nov. **1956.** 18 p. 10 figs., 6 tables, 14 refs. **DWB** (M:510 S478p)—The orenz integrated wave number is derived from a Fourier series expansion of the pressure rofile along a latitude. This number is calculated for 10 latitudes in the N. Hemisphere r each day of 10 yrs in an attempt to find an objective method for stating the pressure system the Hemisphere. It is found by graphical and statistical analysis that the number is ghly correlated with the westerly index at certain latitudes as well as with solar indices. *ubject Headings:* **1. Lorenz wave numbers 2. Zonal indices 3. Northern Hemisphere nalysis 4. Solar-pressure relationships.**—*M.R. & partly from author's abstract.*

10.2–238 551.543:525.6

Siebert, Manfred, **Tidal oscillations in an atmosphere with meridional temperature adient.** New York Univ. College of Engineering Research Div., Contract AF 19(604)-1738, cientific Report No. 3, July **1957.** 16 p. 9 refs., 47 eqs.—It is shown that a solution of the ndamental equations of atmospheric tides can be found for an atmosphere with a meridional mperature gradient if four simplifying assumptions are made: independence of the unsturbed temperature of height, absence of gravitational tidal forces, absence of horizontal essure gradients in the undisturbed atmosphere, and smallness of the meridional temperature adient. The result may be interpreted to mean that the eigenvalue of the described atosphere is the same as that of a completely isothermal atmosphere, provided the equivalent pths of the different wave types and the resonance formulas relating excitation and disrbances are changed slightly. This change, however, seems to be generally negligibly small. *ubject Heading:* **1. Atmospheric tides.**—*Author's abstract.*

10.2–239 551.547:551.507.362.1

Ripley, William S., **Comparison of Russian and American upper air data at rocket altitudes.** S. Air Force Cambridge Research Center, Jan. **1958.** 6 p. 3 figs., 2 tables, 8 refs. Typeript. **DWB** (M10.535 R592co)—Pressure data obtained by means of rockets over central ropean U.S.S.R. up to an altitude of 100 km are plotted against similar data obtained er the U. S. The two pressure-vs.-altitude curves cross at 80 km; above that altitude the ssian pressure values are lower and below that altitude higher than the American values. sufficiency of number of measurements or geographical differences are suggested as probable uses of the discrepancies. *Subject Headings:* **1. Rocket data comparisons 2. Pressure data screpancies between American and Russian observations.**—*G.T.*

10.2–240 551.547.

Saidnazarov, Kh., **Uroven' minimal'nykh mezhdusutochnykh izmeneniĭ davleniia troposfere nad Tashkentom.** [Level of minimum interdiurnal pressure variations in the troposphere over Tashkent.] (In: Akademiia Nauk Uzbekskoĭ SSR. Institut Matematiki Mekhaniki, **Meteorologiia i gidrologiia v Uzbekistane.** Tashkent, **1955.** p. 211–212. table. **DLC**—In order to discern the presence of regularities in the distribution of the level of minimum interdiurnal pressure variations only those cases of cooling or warming, when the entire troposphere is cooled or warmed simultaneously, are examined. Forty-nine cases of warming and 50 of cooling for both the warm (April–Sept.) and cool (Oct.–March) seasons have been selected. The interdiurnal pressure changes for each kilometer of elevation were computed for the warm and cold season and the data are presented in a table. In the case of the conditions selected, the level of minimum interdiurnal pressure change both during the warm and cold part of the year is situated at approximately 2550 m during warming and at 3150 m during cooling. *Subject Headings:* **1. Interdiurnal pressure variations 2. Tropospheric cooling and warming 3. Tashkent, U.S.S.R.**—*I.L.D.*

TURBULENCE AND HORIZONTAL WIND DISTRIBUTION

See also: **Gust effects on airplanes** (Eggleston), 10.2–87; **Aircraft response to atmospheric turbulence** (Bullen), 10.2–88; **Thunderstorm gusts** (Foster), 10.2–208; **Turbulent transfer of heat** (Malkevich), 10.2–227; **Jet-stream and upper-air turbulence** (Raethjen), 10.2–252; **Advective fog dissipation, European U.S.S.R.** (Koshelenko), 10.2–274.

10.2–241 551.551.

Wei, Y. H., **Clear-air turbulence at the troposphere.** *Meteorological Bulletin*, Taipei Formosa, 3(4):16–19, Dec. **1957.** 4 figs., 2 tables. In Chinese; English summary p. 16 **DLC** (Orientalia)—Strong clear-air turbulence was generally associated with the appearance of jet stream in the high levels of atmosphere. The jet stream was stronger at higher latitudes than the lower and the clear air turbulence was to be found in the same case. Both intensity and scale of such turbulence had a close relation to the topographic features. Clear air turbulence often gave much trouble to aircraft. Its shape showed in a strip-form and extended to its extremity in windward directions. Some stronger turbulences happened most in winter at an altitude about 25,000 ft and its high frequency was found to northern and right lower portion of the center of maximum velocity in a jet stream. These turbulences appeared in the trough line of a cold low at high level. The frequency of appearance of clear air turbulence in the S.E. part of China showed higher and its intensity was often stronger than the southern part of U. S. The clear air turbulences induced by cold lows or in troughs at high level mainly were to be found at those stations to the north of Yangtze. *Subject Headings:* **1. Clear air turbulence 2. Jet stream turbulence.**—*Author's abstract.*

10.2–242 551.551.8:551.511.6 551.55

Palm, Enok, **On Reynolds stress, turbulent diffusion and velocity profile in a stratified fluid.** *Geofysiske Publikasjoner*, Oslo, 20(2); Jan. **1958.** 13 p. 8 refs., mostly eqs. **DLC**— The two first sections contain a discussion of the Reynolds stresses in an adiabatic atmosphere. Triple correlations are cancelled compared with second order correlations, and

$$\tau_z = Q\left(U_{zz}\int_0^t \overline{\omega(s)\omega(t)}ds + U_z\frac{d}{dz}\int_0^t \overline{\nu(s)\nu(t)}ds\right)$$

is obtained. Here τ denotes the Reynolds stress, Q mean density, U mean velocity, t time, ω vertical velocity, ν horizontal velocity perpendicular to the mean velocity and subscript z indicates differentiation with respect to z. In Sec. 3, the same way of reasoning is applied to turbulent diffusion, and in Sec. 4 a derivation of a formula for the velocity profile in a stratified fluid is given. It is found that, approximately,

$$U_z = CZ^{-1+S\epsilon}$$

where C and ϵ are constants, and $S=g(\Theta_z/\Theta)$ with Θ denoting potential temperature. *Subject Headings:* **1. Reynolds stress 2. Turbulent diffusion 3. Velocity profiles.**—*Author's abstract*

10.2–243 551.552:551.51

Krechmer, S. I., **K voprosu ob izmenchivosti napravleniia vetra.** [Question of variability wind direction.] *Akademiia Nauk SSSR. Geofizicheskiĭ Institut, Trudy*, No. 33 (160):48–**1957.** 10 figs. (graphs, 2 fold.), 7 refs., 8 eqs. **DLC**—An analysis and interpretation of a obtained during a field expedition in the summer of 1954 by the Atmospheric Turbulence boratory of the Geophysical Institute is presented, with selected anemograph records, quency histograms, scatter diagrams, data, etc. The relation between micropulsations of ection and of speed for different cases and speeds is clearly demonstrated. *Subject Headings:* **Wind direction—speed relationships 2. Wind microvariations 3. Turbulence data.**—*M.R.*

WIND VARIATIONS AND VERTICAL DISTRIBUTION

See also: **Monsoons** (Pédelaborde), 10.2–8; **Monsoon season weather summaries, India, 10.2–129; Reynolds stress** (Palm), 10.2–242.

10.2–244 551.553.12

Yoshino, M. (*Tokyo Kyôiku Univ., Tokyo*), **The structure of surface winds crossing over a all valley.** *Meteorological Society of Japan, Tokyo, Journal*, Ser. 2, 35(3):184–195, June **57.** 18 figs., 4 tables, 16 refs., 5 eqs. **DWB, DLC**—The observations of surface winds ssing over a valley were made in detail, taking account of the various characters according the cross-section shape of the valley. The 30 min. mean wind speed, its decreasing rate at shadow side and the exposed side of the valley slope, the intensity of turbulence, the mean nd direction, analysis with the aid of isopleths, and the formation processes of the eddies and -valley winds in the valley were studied from a microclimatological viewpoint. The im-rtant results obtained are: the highly correlated experimental equations which connect the creasing rate of mean wind speed and the valley topography, the difference of relationships tween $\sqrt{\overline{u'^2}}$ and the mean wind speed at the respective sides of the valley slope from that the flat horizontal surface, the clear distinction between mean wind speed and directions the deep valley from those in the shallow one, and the cyclic deformation of the eddies in the lley. *Subject Headings:* **1. Valley winds 2. Surface wind analysis.**—*Author's abstract.*

10.2–245 551.553.21:551.515.2(54)

George, C. A. (*Met. Office, Calcutta Airport*), **Breaks in the Indian Southwest monsoon d Pacific typhoons.** *Indian Journal of Meteorology and Geophysics*, Delhi, 8(4):460–461, t. **1957.** 6 refs. *Current Science.* **DWB, DLC**—The author challenges the conclusion de by Raman (1955, *see* 8.6–253, June 1957, *MAB*) that the onset of the break in the south-st monsoon over India is related to the location of typhoons in the southwest Pacific north lat. 30°N. Both the statistical relations and the meteorological explanation are critically amined and found insufficient or unconvincing. The true understanding must await equate data for the upper troposphere over India. *Subject Headings:* **1. Monsoon-typhoon ationships 2. Southwest monsoon break forecasting 3. India.**—*M.R.*

10.2–246 551.553.21

Sorochan, O. G., **Nekotorye osobennosti mussonnoĭ tsirkuliatsii Vostochnoĭ Azii.** [Cer-n characteristics of monsoon circulation of eastern Asia.] *Leningrad. Glavnaia Geofiziches-a Observatoriia, Trudy*, 70:92–108, **1957.** 10 figs., 3 tables, 9 refs. **DLC**—This study of the ure of eastern Asia monsoons is limited to an analysis of the origin of air masses constituting summer monsoon, and to the determination of whether it is actually confined to the layer uperficial friction (0–700 m) as assumed by O. G. Sorochan. The results of the detailed dy, made on the basis of ample reliable data, show that the eastern Asia summer monsoon n exchange between the ocean and the continent in the 0–5 km layer. Variations in the ance of air masses from the ocean indicate that the concept that the summer monsoon is a rent of the general circulation of the atmosphere, which is a complex interaction of micro-rmic microcirculation factors, is perfectly correct. *Subject Headings:* **1. Monsoon circula-n 2. Eastern Asia.**—*A.M.P.*

SPECIAL WINDS AND WIND EFFECTS

See also: **Microclimate of shelterbelts** (Caborn), 10.2–20; **Oceanic circulation models** (Hassan), 10.2–63; **Wind damage to rice heading, Japan** (Ujiie et al.), 10.2–90; **Wind utilization** (Ledács-Kiss), 10.2–102; **Heating and ventilating** (Reed), 10.2–104; **Mammatus clouds, Central New York State** (Embree), 10.2–277; **Trade wind cumuli, Cape Kumukahi, Hawaii** (Johnson), 10.2–278; **Orographic cloud studies, Mauna Loa, Hawaii** (Mordy), 10.2–279.

10.2–247 551.555.3:59

Undt, W. (*Vienna*), **Der Höhenföhn und seine bioklimatische Bedeutung.** [High altitude föhn and its bioclimatic importance.] *Wetter und Leben*, Vienna, 8(8/11):159–168, **1956.** 16 refs. **DLC**—The author discusses a report on the statistical evaluation of the occurrence of föhn aloft on the basis of low values of relative humidity, summarizes the present knowledge on the nature, evidence and cause of the föhn aloft, and reviews the problem of the biological effects of föhn. *Subject Headings:* **1. High altitude föhn 2. Biological effects of föhn.**—*I.L.D.*

10.2–248 551.556.

†*Chepil, W. S. (*U. S. Dept. Agr., Kan. State Coll. Manhattan*), **The use of evenly spaced hemispheres to evaluate aerodynamic forces on a soil surface.** *American Geophysical Union Transactions*, 39(3):397–404, June **1958.** 4 figs., 6 tables, 11 refs., 5 eqs. **DLC, DWB**—Direct and indirect measurements showed a substantial lift force on the surface roughness elements (such as soil grains resting on the surface) in a windstream. Lift was approximately four-fifths of drag on hemispherical roughness elements ranging from 0.16 to 5.08 cm in height. The ratio of lift to drag on the roughness elements of the surface remained essentially constant for any drag velocity of the fluid and any depth of the fluid boundary layer beyond a relatively shallow depth. The depth of the fluid boundary layer, on the other hand, has a profound influence on the magnitude of both lift and drag. This study throws new light on equilibrium conditions existing between soil grains and moving fluid at the threshold of movement of the grains. *Subject Heading:* **1. Wind erosion measurements.**—*Author's abstract.*

UPPER AIR WINDS

See also: **Jet stream characteristics** (Berggren et al.), 10.2–17; **Project Shower, Oct.–Dec. 1954, Hilo Airport and Mauna Loa, Hawaii** (Eber), 10.2–131; **Monthly mean upper air charts, Japan** (Yamada), 10.2–165; **Jet stream structure, Southeastern U. S.** (Endlich, McLean), 10.2–198; **Jet streams** (Lee), 10.2–199; **Synoptic studies of Bai-u, Japan** (Chen), 10.2–288.

10.2–249 551.557:551.510.53

Anderson, Soren (*Geophysical Inst., Univ. Alaska*), **An instance of possible ionospheric wind in the E region at College, Alaska.** *Alaskan Science Conference, 3rd, Mt. McKinley National Park, Sept.* 22–27, 1952, *Proceedings*, pub. Sept. **1954.** p. 219–221. 2 figs., 5 refs., eqs. **DWB**—Calculation is made of the speed of movement of an E_s cloud (or of the ionization or of both the wind and ionization) at College, Alaska on June 30, 1952 at 2115h, 2130h and 2145h when the vertical height of the F layer was 280 km and the E layer at 120 km. This speed was found to be 395 m/sec. Similar observations by other observers at other places gave values of 92, 85 to 200, 70, 300 and 500 m/sec. *Subject Headings:* **1. Ionospheric wind 2. E_s drift 3. College, Alaska.**—*M.R.*

10.2–250 551.557:551.54

Hutchings, J. W. (*N. Z. Met. Service*), **The correlation between wind and atmospheric pressure.** *Journal of Meteorology*, Boston, 14(6):566–569, Dec. **1957.** 2 tables, 6 refs., 2 eqs. Also: **Comments** by C. E. Buell, *Ibid.*, p. 573. **DWB**—The author finds an arithmetical error in Buell's (*see* 6.1–142, Jan. 1955, *MAB*), calculation of the correlation between observed 700 mb wind and the height of the 700 mb surface, of a factor of 5 (Buell gets 0.1, Hutchings 0.5). This error ruins Fig. 6 of Buell's paper and, as Buell points out in his "Reply,"

akes the correlation much better than he supposed. These correlation coefficients are re-lculated for four places in the N. Hemisphere and compared with BUELL's value. *Subject eading:* **1. Upper air wind-pressure correlation.**—*M.R.*

10.2–251 551.557:551.510.53:629

Unusually strong upper winds experienced by Air India International Super-Constellation. *ıdian Journal of Meteorology and Geophysics*, Delhi, 7(1)66, Jan. **1956.** fig., 2 tables. **DWB, LC**—Unusually strong easterly winds (up to 104 knots) were encountered by an Air India ıternational Super-Constellation flying from Cairo to Bombay at about 0600 GMT on ·pt. 9, 1955, at 17,500 ft between 54° and 66°E. A returning plane, 1000 ft lower and a few ›urs later, encountered only 20–30 kn easterly winds. The strong winds were accompanied ' a deep 500 mb low over the N. Arabian Sea (at 1400 GMT on Sept. 9) but the winds and e low did not appear on the next 500 mb chart (0200 GMT on Sept. 10), so the winds were short duration and in a very narrow belt. *Subject Headings:* **1. High level winds 2. High titude flying 3. Cairo-Bombay air route.**—*M.R.*

10.2–252 551.557.5:551.551.5

Raethjen, P., **Über die Entstehung des "Jet-stream" und seiner Turbulenz.** [Causes the "jet stream" and its turbulence.] *Schweizer Aero-Revue*, Berne, 32(7):384–388, **1957.** figs., 3 refs. **DLC**—The equatorial convective currents have a great part in the genesis and generation of the jet stream. The polar strong turbulence (i.e., in the area of cyclonic tation) is also explained by the author. *Subject Headings:* **1. Jet stream 2. Upper air rbulence 3. Convective currents.**—*A.V.*

10.2–253 551.557.5(52)

Shimada, Y., **Jet stream in the Far East.** *Journal of Meteorological Research*, Tokyo, (3):217–221, March **1958.** 8 figs., 2 tables, 3 refs. In Japanese; English summary p. 217. **WB, DLC**—In this paper, the author examined the jet stream accompanied by the activity remarkable cold front during Oct. 1953 to May 1955, that is: 1) The mean state of polar jet the Far East; 2) Distribution of west component of wind over every isobaric surface; 3) The lationship of jet stream to the difference of air temperature between polar air mass and ›pical air mass; 4) The yearly variation of jet stream height; 5) The fluctuation of jet stream es in the neighborhood of frontal zone. *Subject Headings:* **1. Jet stream 2. Far East.**—*uthor's abstract.*

VERTICAL MOTION

See also: **Thunderstorm-vertical motion in relationships** (Rein), 10.2–210.

10.2–254 551.558.1

Zierep, Jürgen (*Inst. f. Theoretische Gasdynamik, DVL, Aachen*), **Eine rotationssym-etrische Zellularkonvektionsströmung.** [Annular cellular convection current.] *Beiträge r Physik der Atmosphäre*, Frankfurt a.M., 30(4):215–222, **1958.** 3 figs., 5 refs., eqs. Ger-an, English and French summaries p. 15. **DLC**—A theory is given for the convection rrents in a fluid caused by heating at a point in the base. The result is an annular cell ructure where the radii of the cells are obtained by an eigen value problem. The stream nction and the radial pressure distribution are determined. In conclusion the relations of r model to the atmospheric flow patterns are briefly discussed. *Subject Headings:* **1. Con-ction currents 2. Cellular convection.**—*Author's abstract.*

10.2–255 551.558.21

Würtele, M. G., **The three dimensional lee wave.** *Beiträge zur Physik der Atmosphäre*, ankfurt a.M., 29(4):242–252, **1957.** 7 figs., 10 refs., 6 eqs. German, English and French mmaries p. 242. **DWB, DLC**—The model is an isothermal atmosphere with no shear in the sic current. If the perturbations are assumed small, vertical velocities due to an isolated ›untain may be computed at distances from the mountain greater than one stationary ve length (about 5 km). In vertical planes parallel to the basic current, the pattern is

like that of the two-dimensional case studied by LYRA and QUENEY; the tilt of wave crest decreases with increasing distance from the plane through the center of the mountain. In horizontal planes the nodal lines of vertical velocity are hyperbolas with transverse axis along the wind direction; areas of upmotion are crescent shaped, concave downwind, as often observed by pilots. *Subject Heading:* **1. Lee waves.**—*Author's abstract.*

AQUEOUS VAPOR, HYDROMETEORS AND HYDROMETEOROLOGY

HUMIDITY

See also: **N. Hemisphere humidity charts** (Nakarenko), 10.2–127; **Max-min thermometers** (Tanner, Suomi), 10.2–141; **Water vapor spectroscopy** (Regula), 10.2–216; **Supercooled water** (Lafarge), 10.2–271; **Trade wind cumuli, Cape Kumukahi, Hawaii** (Johnson), 10.2–278.

10.2–256 551.5

Aujeszky, László, **A föld légkörében jelenlévő túlhűlt vízkészlet tömegének hozzávetőleges megbecsülése.** [Approximate estimate of the supercooled water supply in the earth's atmosphere.] *Időjárás*, Budapest, 55(1/2):31, Jan./Feb. **1951.** English summary p. 5 **DLC**—In an earlier paper the author estimated the total average (liquid and solid) water content of the earth's atmosphere at 3×10^{11} metric tons. He believes that the supercooled portion of this amount is between 10^{11} and 2.10^{11} tons. *Subject Heading:* **1. Supercooled water amount in atmosphere.**—*G.T.*

10.2–257 551.571.7:551.511:551.509.21(57

§Orlova, V. V., **Vlagooborot Zapadnoĭ Sibiri vo vlazhnye i zasushlivye vegetatsionnye periody.** [Moisture exchange in eastern Siberia during wet and dry vegetation periods.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, 70:48–59, **1957.** 5 figs., 5 tables, 7 refs. **DLC**—The study was made on the basis of synoptic charts for two wet and two dry months (May 1951 and 1954, and Aug. 1954 and 1955), during each of which precipitation was connected with a determined cyclonic formation. Projectories of air particle transportation were constructed for warm and cold air masses at 850, 700 and 500 mb levels, for the purpose of determining the source of the air mass. A comparison of wet and dry periods showed increased recurrence of the carrying out of oceanic moisture in the wet periods. However the increase of moisture was only 12.2% on the average. Western Siberia appears to be located at the junction of two influences. *Subject Headings:* **1. Moisture exchange over continents 2. Heat and moisture transport 3. Upper air humidity charts 4. Western Siberia, U.S.S.R.**—*A.M.P.*

10.2–258 551.571:551.508

Vassy, A. and E. (*Paris*), **Nouvel appareil pour la mesure de l'épaisseur d'eau condensable.** [New apparatus for measuring the thickness of condensable water.] *I.U.G.G. Association of Meteorology, Rome*, 1954, *Scientific Proceedings*. London, Butterworth, 195 p. 215–216. fig. **DWB**—A brief description with the aid of a diagram of a device for measuring the thickness of condensable water is given. It is composed essentially of a single cell isolating two regions of the spectrum, one towards 9400 Å where absorption by water vapor occurs, and the other towards 8600 Å where this absorption is negligible. The solar radiation thus isolated is measured by means of a photoelectric Ca/Ag cell. The thickness of considerable atmospheric water is determined by the intensity relationship. This device has revealed a diurnal variation of considerable amplitude in the thickness of condensable water, and if the daily variation is very regular most of the time, the points forming a perfect curve, then discontinuities may occur in connection with particular meteorological situations. The water vapor is then found to be distributed in the atmosphere in a heterogeneous state. *Subject Heading:* **1. Precipitable water measurement.**—*I.L.D.*

10.2–259 551.571.1:551.45:551.79

Starr, V. P. (*Mass. Inst. of Technology*) and Peixoto, J. P. (*Univ. of Lisbon & Natl. Met. Service of Portugal*), **On the global balance of water vapor and the hydrology of deserts.** *Tellus*, Stockholm, 10(2):188–194, May **1958.** 3 figs., 9 refs., 2 eqs. **DWB, DLC.** Also in Massachusetts Institute of Technology. Dept. of Meteorology, Contract AF 19(604)-1000, Final Report, Dec. 31, **1957.** p. 109–123. 3 figs., 9 refs., 2 eqs. **DWB**—An attempt is made to measure the horizontal divergence of the vertically integrated moisture flux over the Northern Hemisphere for the calendar year of 1950. This is done through the evaluation of daily data for some 90 upper air stations at several levels up to 500 mb. The final map obtained indicates strong maxima of divergence not only over certain oceanic regions, but also over three separate arid regions. Such a result implies an unexpectedly large excess of evaporation over precipitation in these latter areas, which must be balanced by convergence of liquid water on and below the ground surface, unless the year studied was rather completely different from normal, this not being so likely, however. *Subject Headings:* **1. Moisture balance 2. Desert hydrology.**—*Authors' abstract.*

10.2–260 551.571.4

Starr, V. P.; Peixoto, J. P. and Livadas, G. C., **On the meridional flux of water vapor in the Northern Hemisphere.** *Geofisica Pura e Applicata*, Milan, Vol. 39:174–185, Jan./April **1958.** 4 figs., 2 tables, 15 refs., 6 eqs. English and French summaries p. 174. **DLC**—Maps of the meridional vertically integrated flux of atmospheric water vapor over the Northern Hemisphere for summer, winter and the entire year of 1950 are presented. These results are derived from all available meteorological soundings of humidity and winds. A corresponding set of three maps showing the average vertically integrated values of the moisture content are included. Tables and graphs of zonally averaged numerical values extracted from these maps are reproduced and discussed in the light of various meteorological considerations. *Subject Headings:* **1. Meridional vertical flux of water vapor 2. Northern Hemisphere.**—*Authors' abstract.*

EVAPORATION AND EVAPOTRANSPIRATION

See also: **Evapotranspiration nomograms, Manhattan, Kans.** (van der Bijl), 10.2–21; **Evaporation from seas, Japan** (Ito), 10.2–194.

10.2–261 551.573:581.11

*Shanbhag, G. Y. (*M. J. College, Jalgaon*), **Some notes on evapo-transpiration, evaporation from soil and transpiration.** *Indian Journal of Meteorology and Geophysics*, Delhi, 8(2):127–136, April **1957.** 38 refs. **DWB, DLC**—General remarks on various aspects and processes of evaporation from soil and plants, soil moisture, evapotranspiration, physical and biological factors, etc. It is concluded that transpiration removes more water in a unit time from the soil, since its works simultaneously on the whole volume of soil occupied by the roots. *Subject Headings:* **1. Evaporation from soil 2. Evapotranspiration.**—*M.R.*

10.2–262 551.573:551.511.33:581.11

Suomi, V. E. and Tanner, C. B. (*both, Dept. of Soils, Univ. of Wisconsin*), **Evapotranspiration estimates from heat-budget measurements over a field crop.** *American Geophysical Union, Transactions*, 39(2):298–304, April **1958.** 12 figs., 12 refs., 6 eqs. **DWB, DLC**—The heat transfer processes which occur at the earth's surface have direct bearing on many of the physical problems in agriculture that relate to the plant environment. The evapotranspiration from a crop can be estimated from the disposition of solar and sensible energy available at the earth-air interface. A suitable measurement of the heat budget, including net radiation, heat transfer by soil conduction, air-temperature gradient above the crop, and vapor pressure gradient above the crop, will account for the fraction of solar energy used hourly or daily for evapotranspiration. The simple theory, a brief description of the experimental equipment, and some illustrative measurements are discussed (made at the Univ. of Wisconsin Experimental farms at Hancock, Wis., Aug. 19–Sept. 3, 1955). *Subject Headings:* **1. Evapotranspiration estimates 2. Soil-air heat exchange.**—*Authors' abstract.*

CONDENSATION

See also: **Aircraft icing data** (Samuels), 10.2–86; **Cloud microstructure and stability** (Squires), 10.2–280; **Cloud microstructure and stability** (Squires, Twomey), 10.2–281.

10.2–263 551.574.1

Das, P. K. (*Met. Off., Gauhati*), **The change in the distribution of drops in a cloud.** *Indian Journal of Meteorology and Geophysics*, Delhi, 7(1):55–60, Jan. **1956.** 8 figs., 3 tables, 4 refs., 6 eqs. **DWB, DLC**—The change in the drop size spectrum, and the liquid water content has been computed for different types of distribution curves. The drop size distribution was assumed to follow a Gaussian curve, and the change in the spectrum was computed numerically from an equation developed by SCHUMANN. It is shown that the number of large drops in a cloud cannot increase by coalescence, unless the spectrum has a very large range or a sharp peak. *Subject Heading:* **1. Cloud droplet size distribution.**—*Author's abstract.*

10.2–264 551.574.1:551.594.12

De Bernochi, Cesare, **Sulla genesi elettrica dei germi cristallini agenti come nuclei di congelamento.** [Electric origin of crystal nuclei acting as freezing nuclei.] *Geofisica e Meteorologia*, Genoa, 5(3/4):44–48, May/Aug. **1957.** 4 figs., 8 refs., eqs. **DWB**—Evidence is presented for the hypothesis that condensation nuclei consist of sea salt, and the conditions under which supercooled cloud droplets freeze (temperature of 40°–60°C and when colliding against obstacles) are discussed. The occurrence of hail after lightning, the possible role of an electrical charge acting as a shock wave, causing the freezing of supercooled droplets, and the electrical processes involved in the origin of such shock waves are considered and the equations for computing the order of magnitude of the pressure developed within an ionized column of air are discussed. This equation is

$$P_{\max} = \frac{u_0 \cdot I_3}{4\pi^2 R^2},$$

where $P_{\max}$ is the maximum pressure on the axis of the cone of an ionized column, u_0—magnetic permeability of air, I—intensity of the current and R—the radius of the column of ionized air. The second part of this study deals with the experimental production of crystalline nuclei under laboratory conditions involving a supercooled cloud in a cold chamber and artificially produced electric charge with a current intensity of thousands of amperes. The experimental procedure is described with the aid of photographs of the apparatus and crystals produced. It is suggested that a suitable hail prevention measure would be the introduction of condensation nuclei in clouds in order to precipitate existing humidity as rain before the establishment of a supercooled state. *Subject Headings:* **1. Crystalline nuclei 2. Freezing nuclei 3. Electrification of supercooled drops 4. Hail prevention.**—*I.L.D.*

10.2–265 551.574.1:551.578.11

Hitschfeld, Walter (*McGill Univ., Montreal*), **Size distribution generated by a random process.** (In: *Conference on the Physics of Cloud and Precipitation Particles, Sept. 1955 Proceedings*, pub. N. Y. Pergamon Press, **1957.** p. 224–228. 3 figs., 6 refs.) **DLC** (QC921.5.U5), **DWB.** Also issued as McGill Univ. Macdonald Physics Lab., Contract AF 19(122)-217, Scientific Report MW-20, Sept. **1956.** p. 1–8. **DWB**—Machine calculations on an idealized model of particles in motion relative to each other, yield size distributions not in close agreement with those measured for rain. When the effects of some of the simplifications in the original model are considered qualitatively, agreement becomes close enough to demonstrate that a random collision process may play a major part in the early stages of the development of rain distributions. *Subject Headings:* **1. Cloud physics 2. Drop size distribution.**—*Author's abstract.*

10.2–266 551.574.1:551.578.4

Komabayasi, M. (*Geophy. Inst., Tokyo Univ.*), **On freezing temperatures of supercooled water drops which contain a melted snow crystal.** *Meteorological Society of Japan, Tokyo Journal*, Ser. 2, 35(3):201–204, June **1957.** 4 figs., 10 refs. **DWB. DLC**—For more than 10 years, several researches have been made to study the nature and the concentration of freezing

nuclei in the actual atmosphere. Most of them were experiments where an expansion or a cold chamber were used to find the concentration of potential nucleating particles. Studies of the actual nuclei in natural snow crystals have been developed along two lines. The one is the electron microscopic study to which KUMAI (1951), OKITA (1952), and ISONO (1955) have made contributions. The other is the study on the freezing temperature of melted snow. VAUGHAN (1954), KIRYUHKIN and PEVZNER (1956) measured the freezing temperatures of melted individual snow crystals where volumes of the melted crystals had a variance according to their original sizes. Here the author presents the freezing temperatures of supercooled water drops with a constant volume containing a melted snow crystal. *Subject Headings:* **1. Freezing nuclei 2. Supercooled water drops.**—*Author's abstract.*

10.2–267 551.574.1:551.578.41

Magono, Choji (*Hokkaido Univ.*), **Recent investigations in cloud physics in Japan.** *Weather Radar Conference, 6th, Cambridge, Mass., March* 26–28, 1957, *Proceedings*, pub. **1957.** p. 357–358. **DWB** (M01.81 R124pc)—Review of studies by NAKAYA, HANAJIMA, KOBAYASHI, ISONO, KUMAI and KUROIWA at Hokkaido and Tokyo Universities, on the crystal growth of snow in aerosol free air. Methods are described for each investigation. Crystals of the needle type are found to be the most common form in the laboratory and in Mauna Lao, Hawaii. Pseudodendritic crystals were formed just below melting level. A table gives the percentage of different foreign nuclei observed with an electron microscope at the center of arrow crystals (1948–55 and 1956). *Subject Headings:* **1. Snow crystal growth 2. Snow crystal nuclei 3. Japan.**—*M.R.*

10.2–268 551.574.1:551.510.42

Mikhel'son, M. L., **O koaguliatsii atmosfernykh iader kondensatsii na pylinkakh.** [Coagulation of atmospheric condensation nuclei on dust particles.] *Kolloidnyĭ Zhurnal*, Moscow, 19(1):125–126, **1957.** 2 figs., 7 refs., 3 eqs. **DLC**—An apparatus is described and illustrated for measuring the number of nuclei and dust particles in a canal or tube, and their decrease as a function of time (shown on a graph). It is concluded that coalescence occurs between the dust and the condensation nuclei, as a result of Brownian movement. Size and number of particles are mentioned. This is important for cleaning air. *Subject Headings:* **1. Coalescence of nuclei on dust 2. Dust nuclei.**—*M.R.*

10.2–269 551.574.1:551.578.41

Warner, J. and Newnham, T. D. (*Radiophysics Lab., Sydney*), **Time lag in ice crystal nucleation in the atmosphere, Pt. 1, Experimental.** *Puy de Dôme, Observatoire, Bulletin*, Ser. 2, No. 1:1–10, Jan./March **1958.** 5 figs., 2 refs. French and English summaries p. 1–2. Also: Fletcher, N. H., **Time lag . . . Pt. 2, Theoretical.** p. 11–18. 2 figs., 2 refs., 13 eqs. French and English summaries p. 11. **DWB**—In Pt. 1, investigations have been made of the effect of exposure time on the number of ice forming nuclei which become active in a given supercooled fog. It is concluded that some nuclei are activated almost immediately but that the slowness of others to act results in the crystal count increasing with time over a period of some tens of minutes. However, the effect is not considered large enough to be important in relating cold box measurements to the conditions obtaining in natural cloud. In Pt. 2, the nucleation of a supercooled cloud by atmospheric nuclei having a continuous range of nucleation temperature is treated theoretically. A general expression is derived which, when applied to the observed distribution of atmospheric nuclei, shows that 20–50% of the ice crystals produced form within the first few seconds, while the remainder form at a gradually decreasing rate with an apparent time constant of about 6 min. There is no fundamental distinction between prompt and delayed nuclei, and cold boxes with short measuring times give a correct picture of the nucleus contant of the atmosphere. *Subject Headings:* **1. Physics of condensation 2. Supercooled clouds 3. Ice crystal nucleation 4. Supercooled fog 5. Nucleation temperature.**—*Authors' abstracts.*

10.2–270 551.574.11:551.510.41

Junge, Christian E. (*GRD, AF Camb. Res. Center, Mass.*), **Chemical analysis of aerosol particles and of gas traces on the Island of Hawaii.** *Tellus*, Stockholm, 9(4):528–537, Nov.

1957. 2 figs., 7 tables, 2 refs. **DWB**—Aerosols of two different size ranges with radii between $0.08 < r < 0.8\mu$ (large particles) and $0.8 < r < 8\mu$ (giant particles) were analyzed for NH_4^+, Cl^-, SO_4^{--} and NO_3^-. Parallel with this, the concentration of corresponding gas traces, that is of NH_3 chlorine components, SO_2 and nitrogen dioxide, was measured. The results show that the giant particles consisted almost entirely of sea spray. Their content of NO_3^- was small compared to the data from the East Coast of the U. S. (Round Hill, Mass. and Homestead, Fla.). The Cl^- content of the large particles was less than 1.5% of that of the giant particles, confirming previous data which showed that the sea spray is almost completely restricted to particles larger than 0.8μ radius. The large particles contained NH_4 in amounts comparable with the other components, indicating the presence of other than sea spray nuclei in this size range. The NH_4 is probably present in the form of $(NH_4)_2SO_4$. Both particle sizes were completely missing in the raining orographic clouds. All gas components were found to be present and the concentrations did not fluctuate very much. They were washed out, to a small degree, if at all, by rain. *Subject Headings:* **1. Aerosol analysis 2. Gaseous composition of the atmosphere 3. Hawaii.**—*Author's abstract.*

10.2–271 551.574.11:551.571.1

Lafarge, Camille, **Sur le rôle joué par les ions dans le phénomène de la surfusion de l'eau.** [Role of ions in the phenomenon of supercooling of water.] *Académie des Sciences, Paris, Comptes Rendus*, 246(12):1894–1896, March 24, **1958. DLC**—When comparing the supercooling of droplets, of the same volume, of a water practically free from strange ions, and of diluted solutions of mineral salts prepared from this water, the author points out that the ions may, in some cases, decrease the water supercooling. However, the fact that ions such as Li^+ and Cs^+, the ionic rays of which are very different, may have the same behavior, seems to prove that the ions do not determine alone the supercooling mechanism. *Subject Headings:* **1. Condensation nuclei 2. Supercooled water.**—*A. V.*

10.2–272 551.574.12:551.576.11

*Squires, P. and Warner, J. (*both, Div. of Radiophysics, C.S.I.R.O., Australia*), **Some measurements in the orographic cloud of the Island of Hawaii and in trade wind cumuli.** *Tellus*, Stockholm, 9(4):475–494, Nov. **1957.** 17 figs., 13 refs., 4 eqs. **DWB**—Cloud drop size concentrations and liquid water content measurements made by runs of a Dakota aircraft in the "Saddle" area of the East slope of Hawaii during Project Shower for Oct. 23 to Dec. 3, 1954 are shown in a number of graphical and tabular analyses wherein the values for orographic clouds are differentiated from those in the seaward cumulus clouds. The apparatus, which was flown by the Royal Australian Air Force at various levels above the slope and in and over the cloud, is discussed and records of individual traverses and flights, and of various successive traverses superimposed, are presented to show how cloud structure varies yet keeps its essential characteristics for some time (allowing rate of movement of cloud elements to be calculated and compared with upper air wind measurements). It is noted that the seaward cumuli are similar in liquid water content, degree of instability and microstructure, etc. to those traversed off the east coast of Australia. The orographic cloud averages 4000 to 5000 ft deep at the coast, decreasing to 2000 ft at the Saddle, and consists of 2 zones, the coastal cellular or cumuliform zone (with the heaviest rain); and with a sharp transition to the stratiform zone about half way up to the Saddle. The orographic cloud contains fewer and larger drops than the seaward cumuli. Tops of various clouds are shown in photographs. *Subject Headings:* **1. Orographic cloud microstructure 2. Aircraft soundings in clouds 3. Project Shower, Oct.–Dec. 1954 4. Cloud drop size distribution data 5. Trade wind cumuli 6. Liquid water content of clouds 7. Hawaii.**—*M. R.*

FOG

10.2–273 551.575:001.1

†Dufour, L. (*Royal Met. Inst., Uccle, Belgium*), **Quelques considérations sur la définition du brouillard.** [Some considerations on the definition of fog.] *Beiträge zur Physik der*

Atmosphäre, Frankfurt a.M., 30(4):289–296, **1958.** fig., table, 28 refs. German, English and French summaries p. 289. **DLC**—After having recalled definitions of mist and fog given in the International Cloud Atlas, the author discusses them and comes to the conclusion that, in most of the cases, these definitions do not distinguish one hydrometeor from the other. Before examining how it is possible to improve this situation, the author gives some theoretical and experimental results regarding mist and fog: droplet sizes, content in liquid water, condensation nuclei and relative humidity. In the light of these data, the author finally concludes that mist and fog are not two distinct hydrometeors but rather one and the same. *Subject Headings:* **1. Fog 2. Mist 3. Definitions.**—*Author's abstract.*

10.2–274 551.575.1:551.551

Koshelenko, I. V., **Meteorologicheskie usloviia obrazovaniia advektivnykh tumanov nad tsentral'noĭ chast'iu Evropeĭskoĭ Territorii Soiuza.** [Meteorological conditions leading to the formation of advective fogs in the central part of European U.S.S.R.] *Kiev, Ukraine. Nauchno-Issledovatel'skiĭ Gidrometeorologicheskiĭ Institut, Trudy*, 4:29–35, **1955.** 3 figs., 2 tables, 4 refs.—The author stresses the importance of turbulence in the formation and dissipation of advective fogs since, during horizontal transport, turbulent motion alters the vertical distribution and humidity. Frequently, the temperature inversion at the earth's surface is accompanied by a humidity inversion, and a turbulent flow of moisture and heat is directed upward, but the rise in temperature as a result of turbulence is partially or fully compensated for by radiation. Hence, at the earth's surface the air approaches saturation. Also, through its effect on the vertical temperature distribution, turbulence influences the transition of low clouds into fog and the transport of fog advective cooling marks the lowest temperature due to turbulence only in coastal areas, where a large horizontal temperature gradient is observed. The role of turbulence in fog formations with varying wind velocities and temperatures is discussed, and data (in a graph and table) are given on the relationship between wind velocity and difference between 0700 hour temperatures and mean normal temperature of the day of fog occurrence, and the frequency of time of beginning of advective fog dissipation at different times of day (for 1949–1953). Advective fogs in the central European part of the U.S.S.R. are divided into two types: 1) those arising at a distance from the forecast district and 2) fogs which are advective in nature but form and spread as low stratiform clouds and only rarely reach the earth. The use of vertical soundings in forecasting advective clouds is illustrated. Data are given on the frequency of transitions of low level clouds into fog at different vertical temperature gradients. *Subject Headings:* **1. Advection fog 2. Advection fog dissipation 3. Turbulence effects on fog 4. European U.S.S.R.**—*I.L.D.*

10.2–275 551.575.1(26)

Ogata, T. and Tamura, Y., **The sea fog over the open sea, Pt. 1.** *Journal of Meteorological Research*, Tokyo, 7(10):633–642, Dec. **1955.** 13 figs., 6 tables, 6 refs. In Japanese; English summary p. 642. Also: Ogata, T.; Kanazawa, M. and Yoshida, F., . . . **Pt. 2.** *Ibid.*, 10(4):253–259, April **1958.** 11 figs., 2 tables, 6 refs. In Japanese. English summary p. 253. **DWB, DLC**—The authors studied the characteristic features of sea fog, mainly advection type fog, over the open sea by using aerological and oceanographical data of Ocean Station Extra (39°N, 153°E) and the following results are obtained (as reported in the first paper): 1. Sea fog occurs most frequently from the end of May to July. The frequency of fog duration shorter than 12 hrs is 83% of the total. The height of upper border of the fog layer is about 400 m, on the average. 2. Air temperature is, on the average, about 2°C higher than sea surface temperature, though it can happen that the former is lower than the latter. The temperature change accompanying the formation and the dissipation of sea fog is +0.3° and −0.2°C, respectively, which is very small compared with land fog. 3. Most frequent wind direction during fog is southerly and its frequency is 80%, while most frequent wind force is 3∼5 in Beaufort scale. The dense sea fog shows the block structure rather than the uniform distribution over the open sea, and its diameter is about 20 km. In the second paper weather situations accompanied by fog or drizzle are classified into 6 types. Data on sea fog over Tango and over the Pacific are presented; air mass relationships are discussed. *Subject Headings:* **1. Sea fog 2. Fog formation.**—*Authors' abstract.*

CLOUDS

See also: **Cloudiness in Arizona, Southwest U. S.** (McDonald), 10.2–22; **Diffusivity coefficient of nuclear clouds, Nevada** (Wilkins), 10.2–180; **Orographic cloud microstructure and trade wind cumuli, Hawaii** (Squires, Warner), 10.2–272; **Liquid water content of clouds** (Komabayasi), 10.2–285.

10.2–276 551.576.1:551.577.2(94)

Bigg, E. K. (*Div. of Radiophysics, C.S.I.R.O., Sydney, Australia*), **January anomalies in cirriform cloud coverage over Australia.** *Journal of Meteorology*, Boston, 14(6):524–526, Dec. **1957.** 3 figs., table, 5 refs. **DWB, DLC**—Records of the occurrence of high level cloud in the period 1939–1956 are examined for 18 representative Australian stations for the last few days of Dec., Jan., and the first few days of Feb. The mean cover for each calendar date is found to fluctuate by as much as 50%, with conspicuous maxima on 28 Dec., 12 Jan., 22 Jan., and 1 Feb. The statistical significance of the fluctuations is examined and it is shown to a high degree of confidence that they are real. The conclusion is reached that the rainfall anomalies found by BOWEN on the same days are related and are also real. *Subject Headings:* **1. Cirrus cloud anomalies 2. Rainfall anomalies 3. Australia.**—*Author's abstract.*

10.2–277 551.576.1:551.558.21:551.511.13

Embree, C. R., **Post-frontal orographic mammatocumulus, Sackets Harbor, N. Y., July 5, 1957.** *Monthly Weather Review*, Wash., D. C., 85(11):383–384, Nov. **1957. DWB**—A detailed account of orographic cloud effects over central New York State during a period with generally clear skies and good visibility, in contrast to the usual low overcast and rain that obscures the local effects of the Allegheny and Tug Hill plateaus, Adirondack Mts., Lake Ontario and the Lake Plain. The writer was driving around the area north of Syracuse during the period from noon to 7 p.m. on July 5, 1957, when a cool post-frontal mass of polar continental air was moving rapidly eastward from Lake Ontario, with strong on-shore winds and convective instability (lenticular clouds with mammatus of formations underneath), and a thunderstorm. *Subject Headings:* **1. Orographic clouds 2. Mammatus clouds 3. Post-frontal cloud formations 4. Central New York State.**—*M.R.*

10.2–278 551.576.1:551.555.1:551.571.7

*Johnson, David S. (*Pineapple Res. Inst. and Experiment Sta., Honolulu*), **Trade wind cloud measurements windward of the island of Hawaii.** *Tellus*, Stockholm, 9(4):495–508, Nov. **1957.** 12 figs., table, 3 refs. **DWB**—Vertical aircraft sounding records of dry and wet bulb temp., and mixing ratio over the sea east (windward) of the island of Hawaii, during Project Shower, Oct. 21–Dec. 3, 1954 (to about 10,000 ft on some occasions) are tabulated and shown on adiabatic charts and compared with data from horizontal traverses on "budget days" when flights were made through clouds over the sea, with liquid water content measuring equipment. Equipment is described and illustrated, and soundings partially analyzed and examples of typical conditions cited. Below 4000 ft the mixing ratio curve is often a mirror image of the temp. curve, showing cells and descending air which have not had time to "mix" and thus neutralize the temp. and moisture differences. Geographical variations of moisture and rainfall are discussed briefly. *Subject Headings:* **1. Project Shower, Oct.–Dec. 1954 2. Aircraft sounding in clouds 3. Trade wind cumuli 4. Upper air humidity 5. Cape Kumukahi, Hawaii.**—*M.R.*

10.2–279 551.576.1:551.555.1:551.558.21

Mordy, W. A. (*International Met. Inst., Stockholm*), **Geographic and climatic notes on the Project Shower area.** *Tellus*, Stockholm, 9(4):472–474, Nov. **1957.** 4 figs., ref. **DWB**—Schematic and actual map of the island of Hawaii are presented to show the orographic cloud that was studied during Project Shower, and the location of rain gages, wind measurements and cameras along the coast, and 2 lines running inland on either side of the Saddle between Mauna Loa and Mauna Kea. An isohyetal chart shows annual rainfall and a histogram-profile shows level of maximum rainfall in 24 hrs to be at 3000–5000 ft elevation or where the

cloud thickness is greatest and not at high elevations. This is also nicely shown in a schematic profile of the cloud through the "Saddle" compared with the profile of Mauna Loa and the bottom of the trade wind inversion (which also rises above 1000 ft from the sea inland). The advantages of this cloud, with 4 fixed boundaries are outlined for study. *Subject Headings:* **1. Orographic cloud studies 2. Trade wind cumuli 3. Project Shower Oct.–Dec. 1954 4. Mauna Loa, Hawaii.**—*M.R.*

10.2–280 551.576.11:551.574.1

Squires, P. (*Div. of Radiophysics, C.S.I.R.O. Sydney, Australia*), **The microstructure and colloidal stability of warm clouds Pt. 1, The relation between structure and stability.** *Tellus*, Stockholm, 10(2):256–261, May **1958.** 6 figs., table, 8 refs. **Pt. 2, The causes of the variations in microstructure.** p. 262–271. 2 tables, 18 refs., 6 eqs. **DWB, DLC**—Observations on the droplet spectra of different kinds of warm clouds have shown that systematic differences in microstructure exist between the various cloud types. These differences in microstructure are related in a simple way to differences in observed colloidal stability. In Pt. 2, an attempt is made to explore the causes of the differences in microstructure between the Hawaiian orographic cloud, maritime cumuli and continental cumuli, observations on which were discussed in Pt. 1 of this series. *Subject Headings:* **1. Cloud microstructure 2. Cloud stability.**—*Author's abstract.*

10.2–281 551.576.11:551.574.1

Squires, P. and Twomey, S. (*both, Div. of Radiophysics, C.S.I.R.O., Sydney, Australia*), **Some observations relating to the stability of warm cumuli.** *Tellus*, Stockholm, 10(2):272–274, May **1958.** fig., 6 refs. **DWB, DLC**—Simultaneous observations of giant sea salt nuclei and droplet spectra in cumuli have shown that variations in the concentration of these nuclei have no direct effect on the microstructure of cumuli. *Subject Headings:* **1. Cloud microstructure 2. Cloud stability.**—*Authors' abstract.*

10.2–282 551.576.12

Antropova, U. I., **Ob odnoĭ zimneĭ forme oblakov v gorakh.** [Winter cloud form in mountains.] *Meteorologiia i Gidrologiia*, No. 11:34–35, Nov. **1956. DWB, DLC**—A description of a singular cloud similar to a broken cumulus cloud observed at the Sary-Tash station (Alai valley) is given. They arise as a result of strong atmospheric turbulence, embracing in its motion the upper snow layer on mountain slopes. These clouds are observed 15 days a month. Their number varies, depending upon the wind velocities prevailing in the mountain. The author describes the actual formation of such clouds as observed by him Jan. 9, 1944. Such white broken iridescent clouds are observed not only in the Alai Mountains at heights above 3000 m but also in the Arctic on Novaya Zemlya in the region of Matůchkin Shar where the relief is dissected (slopes and deep ravines). *Subject Headings:* **1. Cloud forms 2. Orographic clouds 3. Sary-Tash, U.S.S.R. 4. Novaya Zemlya, U.S.S.R.**—*I.L.D.*

10.2–283 551.576.12:778.58

*Eber, Laurence E., **Photographic cloud observations.** *Tellus*, Stockholm, 9(4):581–585, Nov. **1957.** 2 figs., table. **DWB**—time-lapse cloud photographs were taken over the Saddle in N.E. Hawaii during Project Shower from Oct. 21–Dec. 4, 1954 to provide a continuous record of cloud conditions during the daytime in the area. The 16 mm movie cameras were located 30 mi from the coast at 9000 ft elevation on the N.E. slope of Mauna Loa, a clock was mounted on each camera so that the time appeared on each exposure (which were made at 2 min. intervals.) The combined fields of view of the 2 cameras covered 80° of the N.E. quadrant from the summit of Mauna Kea across the Saddle toward Mauna Loa. Orographic clouds were classified into 7 types and the extent of the cloud by a scale of 1–5, position of top and base on a scale of 1–6, and direction of flow, which could be determined at times from rapid projection of the time-lapse pictures, are all tabulated for selected periods each day. *Subject Headings:* **1. Project Shower, Oct.–Dec. 1954 2. Time lapse photography 3. Cloud photography 4. Mauna Loa, Hawaii.**—*M.R.*

PRECIPITATION

See also: **Precipitation trends, Greenland** (Diamond), 10.2–42; **Rainfall effects on potato and corn yields** (de Ferrière et al.), 10.2–91; **Rainfall effects on crop yield, India** (Mallik), 10.2–95; **Precipitation meas. techniques, Alps** (Tollner), 10.2–124; **Precipitation meas.** (Bruce, Potter), 10.2–125; **Isohyetal charts** (Franceschini), 10.2–126; **Radioactivity in precipitation** (Wilkins), 10.2–182; **Radioactivity in rain water** (Setter, Straub), 10.2–183; **Cirrus cloud and rainfall anomalies, Australia** (Bigg), 10.2–276.

10.2–284 551.577(569.4)

†*Katsnelson, J., **Rainfall intensities in Palestine.** *Israel. Meteorological Service, [Publications], Ser. E,* No. 3, **1955.** 24 p. 3 figs., 5 tables, 16 refs. In Hebrew. Also his: **Rainfall variability in Palestine and the statistical methods for measuring it.** *Ibid.,* No. 4, **1956.** 32 p. chart, tables, 23 refs. Also his: **Rainfall distribution in Palestine by area and season.** *Ibid.,* No. 5, **1956.** 23 p. 2 figs., chart, 8 tables, foot-refs. **DWB** (M055 I85se)—The first of these three studies on rainfall in Israel contains tabulated and graphical data on the frequency distribution of rainfall intensities for 1925–1949. In the second report, rainfall variability at different stations during different periods is analyzed by means of a variety of statistical formulas. A map of Israel is presented, showing lines of equal annual variability of rainfall amount as a percentage of the average for 1921–1950. Lowest values of seasonal variability are found along the coast line and in the mountain region around Hebron. An English-Hebrew dictionary of some forty statistical terms is included. The third paper takes up the regional and seasonal distribution, including a map of average annual rainfall amounts for the period 1921–1950. Average amounts vary from 29 mm/year in the Haarava region to 1000 mm in the mountains near the Lebanese border. *Subject Headings:* **1. Rainfall data 2. Hebrew language 3. Israel.**—*G.T.*

10.2–285 551.577.11:551.576.5

Komabayasi, M. (*Geophysical Inst., Tokyo Univ.*), **Liquid water content as a function of upward velocity (Some aspects of rain formation in warm cloud, Pt. 2).** *Meteorological Society of Japan, Tokyo, Journal,* Ser. 2, 35(5):266–277, Oct. **1957.** 3 figs., 2 tables, 13 refs., 16 eqs. **DWB, DLC**—The liquid water content of a precipitating warm cloud is expressed as a function of upward velocity, taking into account the difference between the rate of condensation which accumulates the liquid water in the cloud and the rate of rainfall, which carries it out of the cloud. As for the condensation nuclei of raindrops, a simplified analytical expression of WOODCOCK's size distribution (1953) is used. The liquid water content in a steady state is found to be proportional to $\frac{1}{3}$ power of the upward velocity, the numerical values of which, for example, are 0.42, 0.90 and 1.93 g/m³, for upward velocities 10 cm/sec, 1 and 10 m/sec, respectively, in a typical condition for the cloud and sea salt nuclei. In transient state, the liquid water content of the cloud is found to take a maximum at a certain time after the beginning of cloud formation if upward velocities are larger than 10 cm/sec; thereafter it begins to decrease, due to falling out of raindrops, and approaches a value of steady state. Preferred appropriate upward velocity for initial raindrop formation, due to the presence of large sea salt nuclei, is discriminated from that due to the coalescence mechanism under the presence of various size distribution of nuclei. Effect of the entrainment of surrounding air into cloud on the salinity of rain water is qualitatively discussed from the viewpoint of nuclei budget of the cloud. *Subject Headings:* **1. Raindrop formation 2. Liquid water content of clouds 3. Vertical velocity in clouds.**—*Author's abstract.*

10.2–286 551.508.77:551.577.2(26)

*Verploegh, G., **Rainfall measurements aboard the Netherlands Ocean Weather Ships "Cirrus" and "Cumulus."** *Netherlands. Meteorologisch Instituut, Wetenschappelijk Rapport W. R.* 57-033 (IV-014), **1957.** 14 p. 3 figs., 5 tables. **DWB** (M77.2 V551ra)—This paper summarizes the results of various experiments, carried out in 1956 on board the Netherlands ocean weather ships, and partly also at the Meteorological Institute at De Bilt, on the measurement of rainfall at sea with the German conical marine rain gage, of the type shown at the second session of CMM at Hamburg. This rain gage, which is hoisted in the rigging of the ship at a sufficient height above the deck, proves to be a practical instrument for routine

observations. It is found that the disturbance of the air flow by the gage itself does not give rise to important errors in the readings. However, when securing the gage in its position, small accidental tilts of the orifice from the "horizontal" plane cannot be avoided. The errors which are thus introduced into the individual observations are generally proportional to the rainfall itself and may form a large percentage of the latter. Since the deviations caused by this effect are both positive and negative, the errors in the mean monthly amount of precipitation will generally be less. For the Netherlands observations they amounted to 10–15%. *Subject Headings:* **1. Rainfall measurements 2. Rainfall at sea 3. Rain gages 4. Netherlands weather ship data.**—*Author's abstract.*

10.2–287 551.577.21

Mordy, Wendell A. and Eber, Laurence E., **Rainfall distribution during Project Shower.** *Tellus*, Stockholm, 9(4):586–590, Nov. **1957.** 28 figs. **DWB**—Isohyetal charts made from records obtained from the usual network and from a special network of rain gages along the Kulani and Saddle roads on Hawaii during Project Shower, Oct.–Dec. 1954, are presented for 28 days from Oct. 21–Dec. 3, 1954. Data for the Budget Days, obtained in more detail, are also presented in isohyetal charts for comparison with other meteorological data obtained on those days. *Subject Headings:* **1. Isohyetal charts for Project Shower 2. Rainfall distribution, Hawaii 3. Project Shower, Oct.–Dec. 1954 4. Hawaii.**—*M.R.*

10.2–288 551.577.32:551.557.5(52)

Chen, Lung-shun (*Inst. of Geophys. and Met., Academia Sinica*), **The variation of wind field along 140°E during the last stage of Mai-Yü.** *Acta Meteorologica Sinica*, Peking, 28(4): 294–302, **1957.** 5 figs., 6 refs. In Chinese; English summary p. 302. **DLC**—Based on wind data at 200 mb over Tateno, Japan, for June-Aug., 1950–1956, the variation of wind field during the last stage of Mai-yü (Bai-u) in eastern Asia is discussed. It is found that the northward displacement of westerly jet stream and the appearance of easterly wind is a good index of the end of Mai-yü period and the beginning of prevailing summer season. In addition, 5-day mean cross sections of zonal wind along 140°E for the period of June and July, 1954–1956 are constructed. From them we further found that during the last stage of Mai-yü, with the northward retreat of the upper westerlies over Japan, the subtropical ridge apparently shifts northward and the typhoons which were limited to the southwestern part of the Pacific now begin to invade the East sea and the Yellow Sea. These facts are probably helpful to forecasting. *Subject Headings:* **1. Bai-u 2. Jet stream effects on bai-u 3. Synoptic studies of bai-u 4. Japan.**—*Author's abstract.*

10.2–289 551.577.32:551.583(43-15)

Dammann, W., **Schwankungen der Sommerniederschläge im Rahmen rezenter Klimaschwankungen in Westdeutschland.** [Variation of summer precipitation in relation to recent climatic fluctuations in West Germany.] *Meteorologische Rundschau*, Berlin, 10(6):197–202, Nov./Dec. **1957.** 7 figs., table, 5 eqs. **DWB, DLC**—The problem of recent climatic fluctuation in West Germany is investigated by analyzing the summer precipitation (May–Sept.) measured at 36 stations in northern and southern Germany over the period 1890–1956. A map showing the distribution of the stations in West Germany, graphs showing 30 yr moving averages of the deviations of means of sums of various meteorological elements from the 1890–1956 mean, namely: sun spot relative numbers in per cent number of summer days of 72 stations in north and south Germany; summer precipitation in means of 72 stations in north and south Germany, etc.; frequency distribution for 1890–1956 of summer totals of precipitation in north and south Germany; summer number of days with precipitation $\geqslant 0.1$ mm, etc.; and a table giving annual total rainfall average for the 30 stations for each year, of the period 1890–1956, are presented. With increasing warming of the summer months and increasing number of summer days, the intensity of precipitation has increased and also the total summer rainfall has become greater. The ratios of rainfall amount to number of summer days have diminished, indicating an increasing tendency of drought during the summer months. A reversal of this tendency seems to have begun in recent years. Fluctuations of precipitation totals and of the number of days with precipitation differ characteristically in north and west Germany, as a result of fluctuations of specific weather situations. The frequency of north

westerly situations has declined while that of southeasterly and southwesterly situations has increased. This may partly explain the increased warming and the rise in precipitation intensity, since the equilibrium between precipitation amount and the number of summer days is disturbed. Since the number of summer days has increased more rapidly than the advection of water vapor, it is evident that increased warming is not only the result of advection but also a consequence of local change in the radiation balance, namely, increasing incoming heat radiation. During the period investigated, the sunspot relative number has risen. *Subject Headings:* **1. Summer precipitation variation 2. Climatic changes 3. West Germany.**—*Author's abstract and I.L.D.*

10.2–290 551.577.37(59)

Ling, C. C., **A short discussion on the rainshowers of March 20, 1957.** *Meteorological Bulletin*, Taipei, Formosa, 3(2):17–18, June **1957.** 3 tables, 3 refs. In Chinese; English summary p. 17. **DLC** (Orientalia)—In spring, rain showers are always occurring in a wide area covering the coasts of Kwangtung, Fukien and Taiwan. This paper discusses the causes of one of these rain showers on March 20, 1957. *Subject Headings:* **1. Rainstorms 2. Southeast China 3. Formosa.**—*Author's abstract.*

10.2–291 551.577.37:551.588.2

*Linsley, Ray K., **Relation between rainfall intensity and topography n northern California.** Stanford Univ. Dept. of Civil Engineering, Contract CPR-11-3185, Research Report, No. 1, June **1956.** 17 p. 7 figs., table, 6 refs. **DWB**—Several methods of estimating the hourly rainfall intensity for a 2-year return period at stations in rugged terrain such as northern Calif. are evaluated for purposes of interpolation. A method worked out by the author at Stanford Univ. since Dec. 1952 is called the Stanford Method 1. It involves use of data from 126 stations with 3–10 yrs of record, and multiple correlation of the following parameters: 1) index daily rainfall; 2) land slope; 3) elevation; 4) orientation; 5) barrier height; 6) zone of environment. The coaxial graphical correlation technique was used, and the nomograms developed are presented. This gave a better coefficient of correlation (0.88) and better fit than the two U. S. Weather Bureau methods tested or than Stanford Method 2. The Weather Bureau methods, however, were not designed for this specific area. Actual data are presented. *Subject Headings:* **1. Rainfall intensity-topography relationships 2. Northern California.** —*M.R.*

10.2–292 551.577.37:551.588.2

Linsley, Ray K., **Correlation of rainfall intensity and topography in northern California.** *American Geophysical Union, Transactions*, 39(1):15–18, Feb. **1958.** 2 figs., 4 refs., 2 eqs. **DWB, DLC**—As part of a long-range program on the hydrology of small watersheds, a correlation between the two-year, one-hour rainfall intensity at 126 recording rainfall stations in northern California and related topographic and climatic parameters has been made. The resulting correlation has a coefficient of correlation of 0.88 and a standard error of 0.067 in./hr. With this relation, it is possible to show the variation of rainfall intensity over the area in much greater detail than has hitherto been possible from observed intensity data alone. This paper discusses the parameters employed, the methods of correlation, and the results obtained. Condensation of paper cited above (10.2–291). *Subject Headings:* **1. Rainfall intensity-topography relationships 2. Northern California.**—*Author's abstract.*

RAIN, SNOW AND HAIL

See also: **Hail and cloud physics** (Ludlam), 10.2–28; **Snow pit studies, Fair Weather Bay, Antarctica** (Swithinbank), 10.2–47; **Project Shower, Oct.–Dec. 1954, Hawaii** (Blanchard, Spencer), 10.2–123; **Cloud physics and drop size distribution** (Hitschfeld), 10.2–265; **Snow crystal growth, Japan** (Magono), 10.2–267; **Ice crystal nucleation** (Warner, Newnham), 10.2–269; **Winter street conditions, Vienna** (Fischer), 10.2–315.

10.2–293 551.578:061.6

American Geophysical Union. Committee on Snow, **Report, 1955–1956, R. A. Work, Chairman.** *American Geophysical Union, Transactions*, 38(1):108–113, Feb. **1957.** fig.

DWB, DLC—Eighteen reports by representatives of as many institutions (mostly in western U. S. and Canada) conducting research on snow, snow melt, ablation, glaciers, forecasts of water supply based on snow surveys, etc., are presented in this substantial progress report. *Subject Headings:* **1. Snow and ice research 2. American Geophysical Union Committee on Snow.**—*M.R.*

10.2–294 551.578.1:551.579.1(522.4)

Uriu, K. and Araki, K., **On the rainfall on the upper part of the river Ōyodo.** *Journal of Meteorological Research*, Tokyo, 9(11):831–835, Nov. **1957.** 11 figs., 3 tables, eqs. In Japanese; English summary p. 831. **DWB, DLC**—The authors examined the characteristic features of rainfall pattern over the drainage area of the Oyodo River during the period from May to Oct., 1955. An investigation of 38 rainfall groups over the period showed that: (1) Relationship between the amount of rainfall and the height of station above the sea level is as shown in Fig. 4. (2) The drainage area of the Oyodo River can be divided into five different divisions. (3) Rainfall pattern is classified into five types, that is, Type-NE, Type-A,SE, Type-A,SW, Type-B,SE and Type-B,SW. *Subject Headings:* **1. Rainfall regimes 2. Oyodo River Basin, Japan.**—*Authors' abstract.*

10.2–295 551.578.11

*Eriksson, Erik (*International Met. Inst., Stockholm*), **Chemical composition of Hawaiian rainfall** *Tellus*, Stockholm, 9(44):509–520, Nov. **1957.** 4 tables. **DWB**—Measurements of the chemical constitution of rain in the Project Shower area showed that the ammonia and nitrate content is very low, and that the total salt content decreases inland to extremely low values on the upper slopes of the volcanoes. *Subject Headings:* **1. Rain composition 2. Project Shower, Oct.–Dec. 1954 3. Hawaii.**—*Author's abstract.*

10.2–296 551.578.11:546.17(73)

Junge, Christian E. (*G.R.D., A. F. Cambridge Res. Center, Bedford, Mass.*), **The distribution of ammonia and nitrate in rain water over the United States.** *American Geophysical Union, Transactions*, 39(2):241–248, April **1958.** 8 figs., 10 refs. **DWB, DLC**—Quarterly average maps of ammonia and nitrate concentration in rain water over the U. S. are discussed. These maps indicate that the major sources for both components are near the ground and over land. Comparison with soil maps makes it very likely that the ammonia distribution is primarily controlled by the acidity of the soil. In case of nitrate, no correlation to other geographical parameters could be found, but again, the soil appears to be the most probable source. *Subject Headings:* **1. Ammonia in rainwater 2. Nitrates in rainwater 3. Rainwater analysis 4. United States.**—*Author's abstract.*

10.2–297 551.578.11:551.577.21

Ouchi, K. (*Akita Univ., Japan*), **On the size distribution of raindrops, Pt. 1.** *Meteorological Society of Japan, Tokyo, Journal*, Ser. 2, 35(3):196–200, June **1957.** 3 figs., table, 2 refs., eqs. In Japanese; English summary p. 196. **DWB, DLC**—Sizes of about 54,000 raindrops are measured for 249 observation periods of 9 rainfalls by filter paper method. Results are analyzed according to the rainfall intensity of each period. 1) Rainfall intensity $R<1$ mm/hr: Graph of logarithm of raindrop number N_d (per cubic meter, per 0.1 mm drop-diameter interval) against diameter d (mm) shows a parabola-like curve. The maximum of N_d occurs at 0.3 or 0.4 mm diameter of drops. The curve resembles the curve (e) of the model calculation by MASON and RAMANADHAM. 2) Rainfall intensity R between 1 mm/hr and 8 mm/hr: Number of raindrops larger than 1 mm in diameter shows remarkable increase compared with the MARSHALL-PALMER distribution. The growing process of the drops larger than 1 mm in diameter seems to be different from that of the smaller drops. *Subject Headings:* **1. Raindrop size distribution 2. Rainfall intensities.**—*Author's abstract.*

10.2–298 551.578.4

Cehak-Trock, Herta, **Der feste Niederschlag im atlantischen Klimagebiet.** [Solid precipitation in the Atlantic climate zone.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B*, Vienna, 8(3/4):352–368, **1957.** 2 figs., 5 tables, 20 refs. **DLC**—On the

basis of station reports distributed from the Arctic to the tropic areas of the Atlantic and extending over the period 1921–1950, the author investigated the mean values of solid precipitation expressed as percentage of the monthly and annual totals of precipitation, the relationship between these percentages, and monthly mean temperature and their dependence upon latitude. The percentage of solid precipitation in total precipitation is not merely a function of geographical latitude, but is influenced by the Gulf Stream in the North Atlantic and the pressure of the stations on islands or coasts. The relation between percentage of solid precipitation and monthly mean temperature is almost linear and is expressed approximately by the equation $F\ (\%) = 50 - 54$. A list of the stations utilized, and their periods of record, tables showing the grouping of stations according to geographical position, and the mean monthly percentage of solid precipitation, mean values of solid precipitation as a function of monthly mean temperature, mean monthly and annual values of temperature [t°C] and percentage [$F\ (\%)$] of solid precipitate on total precipitation, etc. are presented. *Subject Headings:* **1. Solid precipitation data 2. Atlantic area.**—*I.L.D.*

HYDROMETEOROLOGY

See also: **Hydrology textbooks** (Debski), 10.2–2; **Engineering hydrology textbooks** (Butler), 10.2–3; **Moisture balance and desert hydrology** (Starr), 10.2–259; **Rainfall regimes, Oyodo River Basin, Japan** (Uriu, Araki), 10.2–294.

10.2–299 551.579 551.510.41

Aujeszky, László, **Anyakörzések a légkör és a talaj között.** [Exchange of matter between the atmosphere and the soil.] *Időjárás*, Budapest, 55(1/2):3–8, Jan./Feb. **1951. DLC**—General description of physical processes involved in the periodic exchange between the earth (including water) and the atmosphere, of water (hydrologic cycle), carbon dioxide, oxygen, nitrogen and pollutants. *Subject Headings:* **1. Hydrologic cycle 2. Soil-atmosphere interchange.**—*G.T.*

10.3–300 551.579

Pardé, M. (*Inst. de Géographie Alpine, Grenoble*), **Quelques aspects saillants et nouveaux de l'hydrologie de la France d'Outre-Mer.** [Salient and novel hydrological aspects of French territories overseas.] *La Houille Blanche*, Grenoble, 12(2):158–180, March/April **1957.** graphs, tables. **DLC**—Hydrological yearbooks for overseas territories of France (French Equatorial and West Africa, Guadeloupe, Martinique, New Caledonia, Madagascar and Reunion Island) have been published recently for 1949, 1950, 1951, 1952 and 1953. Some peculiarities of tropical, equatorial and insular-intertropical hydrology are derived from these yearbooks in respect of seasonal variations, low water levels, mean annual discharge and floods. *Subject Headings:* **1. Hydrology of French Overseas Territories 2. Seasonal hydrologic variations 3. French Overseas Territories.**—*G.T.*

10.2–301 551.579:546.02:539.16/17

Parker, Frank L. (*Health Phys. Div., Oak Ridge Lab., Tenn.*), **Radioactive tracers in hydrologic studies.** *American Geophysical Union, Transactions*, 39(3):434–439, June **1958.** 6 figs., table, 11 refs., 5 eqs. **DWB, DLC**—The use of radioactive tracers to study phenomena in hydrology that have not previously been easily amenable to investigation is proceeding at a rapid pace. A group of experiments was carried out in lakes and reservoirs in Massachusetts to determine eddy diffusion coefficients. The average eddy diffusion coefficient divided by the radius of the eddy was found to be 0.09 ft/sec. A group of experiments to determine the average velocity of streams and the dilution in streams by use of radioactive tracers was then performed. The diffusion coefficients found in the test of the streams were compared with the theoretical diffusion coefficients of G. I. Taylor for straight pipes and found to be larger due to the increased dispersion caused by bends and obstructions in the stream. A mathematical formulation for general use in determining dilution and dispersion in rivers and streams by radioactive tracers was established. A correction is made for the absorption and decay of the isotope depending upon its chemical and nuclear properties. Work is under way at Harvard University to delineate further the absorption coefficients of

important isotopes under various conditions leading to a better determination of the eddy diffusion coefficient. *Subject Headings:* **1. Radioactive tracers in hydrology 2. Eddy diffusion determination.**—*Author's abstract.*

10.2–302 551.579.1

Potter, W. D. (*Bureau of Public Roads, Wash., D. C.*), **Upper and lower frequency curves for peak rates of runoff.** *American Geophysical Union, Transactions*, 39(1):100–105, Feb. **1958.** 6 figs., table, 2 refs. Also: Alexander, G. N., **Discussion.** *Journal of Geophysical Research*, 64(1):132, Jan. **1959. DWB, DLC**—Maximum annual peak rates of runoff plotted on extremal probability paper have many times been found to exhibit trends that may be defined by two straight lines designated as upper and lower frequency curves. Using a sample of 69 gaged watersheds with periods of record ranging from 26 to 48 yrs, a high degree of correlation is found to exist between the upper and lower frequency curves for 10- and 50-yr recurrence intervals. Tests are made to show that these relations may be used in conjunction with periods of record as short as ten years to materially improve the precision of estimates of peaks on the upper frequency curve. Evidence is presented that suggests that the dog leg in frequency curves is the result of sampling from two different populations of peak rates of runoff. *Subject Headings:* **1. Runoff frequency curves 2. Maximum runoff.**—*Author's abstract.*

10.2–303 551.579

Szigyártó, Zoltán, **A hidrólogiai események visszatérési ideje.** [Recurrence of hydrological events.] *Hidrológiai Közlöny*, Budapest, 37(4):325–329, **1957.** 2 figs., table, eqs. German and English summaries p. 328–329. **DWB**—The paper deals with the time of recurrence of hydrological events occurring once a year, e.g., river stage, discharge, etc., at a fixed time of the year in some section of a watercourse. It is shown that, if the occurrence or absence of the event is independent of the events of the preceding years, the probability of recurrence within a number of years after the previous occurrence may be expressed by a negative binomial or PASCAL distribution. The function values of a PASCAL distribution and its deviations are shown graphically. *Subject Heading:* **1. Hydrologic frequency analysis.**—*From author's abstract.*

10.2–304 551.579.1:551.577.21(522.2)

Sakamoto, T., **The hydrometeorological investigations made around the Bay of Isahaya, Pt. 2.** *Journal of Meteorological Research*, Tokyo, 8(1):March **1956.** fig. In Japanese. **Pt. 3.** *Ibid.*, 9(12):860–866, Dec. **1957.** 10 figs., table, 9 refs. In Japanese; English summary p. 860. **DWB, DLC**—In Pt. 3 the author reports results of hydrometeorological investigations around the Bay of Isahaya which is the western basin of Ariake Bay, with the object giving some planning materials for the project of draining the bay of Ariake, carried out from the year 1953. Some results of the investigations during the year 1955 are reported here as follows: 1) the variation of precipitation along the vertical with the slope of the Tara and Unzen Mts. is shown in figs.; 2) the return period of the maximum possible daily precipitation was calculated according to the method of OGAWARA of the Met. Res. Inst., Japan Meteorological Agency, (as shown in Figs. 6 and 7) and represents the distribution of the maximum possible daily precipitation for the return period of 20 yrs, with which the distribution of the heavy rainfall during the year 1954 to 1955 was compared; 3) the cubic root distribution of the annual or monthly precipitation of the mountain or the plain was studied with the hills, "Unzendake" and "Kitaisahaya," which are situated near the coast of Isahaya Bay, and their features were investigated. Pt. 2 is a brief summary of similar data for 1954. *Subject Headings:* **1. Hydrometeorological data 2. Precipitation data 3. Isahaya Bay area, Japan.**—*Author's abstract.*

10.2–305 551.579.2:551.588.6

Shidei, Tsunahide (*Kyoto Univ., Kyoto*), **Influences of forests on snow.** *Researches on Snow and Ice*, Tokyo, No. 2:195–201, Jan. **1955.** 8 figs., 5 tables, 7 refs. In Japanese. **DWB**—Actual observation of forest effect on deposited snow indicates that there is little effect on the average water equivalent of snow but it delays the snow melt period. Comparative observation of winter average runoffs of ground with and without forest at Kamabutchi Forest

Station from 1945–1953 shows that the open area has a snow melt coefficient (in function of air temperature) 0.2%/day higher than the area with forest. Empirical equations are given. Several graphs and tables relating to the conclusion are presented. *Subject Headings:* **1. Forest influences on snow cover 2. Forest influences on snow melt 3. Snow melt rate 4. Kamabutchi Forest Station, Japan.**—*J. H. Woo.*

10.2–306 551.579.4:519.24

Remson, Irwin and Randolph, J. R. (*both, Ground Water Branch, U. S. Geological Survey, N. J.*), **Application of statistical methods to the analysis of ground-water levels.** *American Geophysical Union, Transactions,* 39(1):75–83, Feb. **1958.** 5 figs., 2 tables, 10 refs., 29 eqs. **DWB, DLC**—Valuable hydrologic information can be obtained from statistical analysis of water level trends. The time-series and the functional-equation approaches are applied to New Jersey well records representing different hydrologic conditions. The results are valuable as concise summaries of the records, for extrapolating observed data, for interpolating between measurements, and for estimating hydrologic factors, such as coefficients of transmissibility and storage, evapotranspiration, and ground water discharge. *Subject Headings:* **1. Water level trends 2. Statistical methods in hydrology 3. New Jersey.**—*Authors' abstract.*

10.2–307 551.579.4:551.311:631.4

Wolman, M. Gordon and Eiler, Jack P. (*both, U. S. Geological Survey, Wash., D. C.*), **Reconnaissance study of erosion and deposition produced by the flood of August 1955 in Connecticut.** *American Geophysical Union, Transactions,* 39(1):1–14, Feb. **1958.** 10 figs., 7 tables, 5 refs. **DWB, DLC**—A large area in the valley bottoms in Connecticut was inundated by the flood of Aug. 1955. Relative to the total area flooded, that part permanently modified by the flow was surprisingly small. Although great in some places, the distribution of these permanent modifications of channel and flood plain was spotty. Erosion of the channel and valley bottom appears to have been most severe in narrow, steep valleys. Environments of deposition were diverse. They appeared to be related to rate and direction of flow, quantity and size of sediments locally available, and in some cases to the presence of vegetation. Most of the coarse sediment deposited in the valley appears to have been derived from local sources, such as valley walls and terraces composed of glacial outwash and till and flood plains containing considerable gravel. Fine sand predominated in most of the sediment deposited. Considering the magnitude of the runoff, the quantity of fine sediment transported or deposited by the flood was small. The maximum observed concentration was 473 parts per million in Scantic River at Broad Brook. Newly deposited fine sediments are thin or absent on the flood plains of many valleys which were beneath 20 ft of slow moving flood waters. The paucity of deposition in such ideal depositional environments also indicates that the flow did not have a high concentration of fine sediments. A number of boulders 5–7 ft in diameter were moved by flood waters in reaches in which smaller gravels were undisturbed. Severe erosion in the uplands was minor. In this reconnaissance, we saw little evidence of newly formed gullies and no areas of severe sheet erosion. This was the case in both woodland and pasture land. Large amounts of subsurface flow and relatively unerodible ground are presumed to be responsible for the absence of erosion. *Subject Headings:* **1. Flood erosion 2. Soil erosion 3. Floods, Connecticut (1955) 4. Connecticut.**—*Authors' abstract.*

CLIMATOLOGY AND BIOCLIMATOLOGY

CLIMATOLOGY

See also: **Physical elements of geog.** (Finch et al.), 10.2–7.

102.–308 551.58:001.8

Eady, E. T. (*Imperial Coll. of Sci. & Tech., Univ. of London*), **Climate.** (In: Bates, D. R. (*ed.*), **The earth and its atmosphere.** N. Y., Basic Books, **1957.** p. 113–129. fig. **DLC**—Climatology is said to be taught and applied mainly from empirically derived rules. The method has proven insufficient in other sciences and is a drawback to progress in climatology.

The statistical approach, averages in space and time, irregular fluctuations, past climates, practical problems (architectural, agricultural, hydrological, aeronautical), effect of oceans on climate and the climate of the oceans are discussed with a move toward a more scientific approach to solving problems in climatology, therefore thinking in terms of causes and mechanisms rather then mere arrangement and analysis or description of data. Many problems may be solved by a long range forecast, but this may be couched in statistical or climatologic terms. *Subject Heading:* **1. Climatological methodology.**—*M.R.*

10.2–309 551.58:63(961.3)

Marshall, Colin (*Brit. Colonial Forest Serv., Kuala Lumpur, Malaya*), **Long term meteorological variations and their effects on land use in small South Pacific Islands.** *Pacific Science Congress, 8th, Quezon City, Philippines, Nov.* 1953, *Proceedings*, Vol. IIA, pub. **1956.** p. 1129–1135. fig., table. **DWB**—A general discussion in which the author stresses the importance of climatological research in the Pacific Ocean with special reference to agriculture. In the Pacific Ocean, secular climatic variations can be studied without complications by the pressure of large land masses. The existence of an apparent cycle of droughts and rainfall is illustrated by rainfall records at Pago-Pago. The need for studying the interrelationships between climate and vegetation is stressed. Data on total annual rainfall at Pago-Pago and Apia (Samoa) are given. *Subject Headings:* **1. Agricultural climatology 2. Climate of South Pacific islands 3. South Pacific.**—*I.L.D.*

CLIMATIC ZONES

See: **Arctic geog. and climate** (Hare), 10.2–35; **Arctic temp. data** (Flohn, Seidel), 10.2–38; **Arctic-Antarctic climatic comparisons** (Holcombe), 10.2–39.

CLIMATE OF PARTICULAR PLACES

See also: **Climate of North China** (Tsiang), 10.2–89; **Climatic analogs, Central Africa and Canal Zone** (Blair), 10.2–317; **Synoptic and air mass climatology, Sardinia** (Serra), 10.2–323.

10.2–310 551.311.12:551.582(711)

*Adkins, C. J. (*Cavendish Lab., Cambridge*), **The summer climate in the accumulation area of the Salmon Glacier.** *Journal of Glaciology*, London, 3(23):195–206, March **1958.** 7 figs., 7 tables, 6 refs., eqs. English and French summaries p. 195. **DWB, DLC**—During the summer of 1957, a party visited the Salmon Glacier in British Columbia. A meteorological station was established in the accumulation area at an altitude of 1700 m. From 12 June to 16 Aug. pressure, temperature and humidity were recorded continuously and the daily totals of precipitation, ablation and percolation were obtained. Periodic measurements of snow density were made; on the first occasion to a depth of 4.7 m and later near the surface only. Occasional observations of snow temperatures to a depth of 12 m were also made. Towards the end of the season, the heat balance of the snow surface was examined in detail. The various contributions to the melting are evaluated for several short periods and their relative magnitudes compared. *Subject Headings:* **1. Glacier climates 2. Climate of Salmon Glacier 3. Salmon Glacier, B. C.**—*Author's abstract.*

10.2–311 551.582.2(669)

*Schramm, Josef, **Das Lokalklima des Mbapit (Kamerun) und sein Einfluss auf die Vegetation.** [The local climate of the Mbapit (Cameroons) and its influence on the vegetation.] *Erdkunde*, Bonn, 12(1):61–64, Feb. **1958.** fig., tables, 8 refs. English summary p. 61. **DLC**—The description of the geology and geomorphology of the Mbapit is followed by a more detailed account of the general climate of this region, West Cameroon Plateau, and of the local climate of the Mbapit. For Koundja, on the Bamu Plateau 25 km north of the Mbapit, the author gives monthly mean air temperature, the 7, 13 and 21 h temperatures for the period Dec. 24, 1955–Jan. 2, 1957 and monthly precipitation for 1955 and describes the

wind and the general climatic features of the area. This is followed by a description of the diurnal temperature regime on the Mbapit, the cloud formations and the winds at different elevations and of the character of the vegetation. *Subject Headings:* **1. Local climates 2. Observational data 3. Climate of Mbapit, Cameroons 4. Mbapit, Cameroons.**—*I.L.D.*

CLIMATIC CHANGES

See also: **General circulation during Pleistocene glaciation** (Ewing, Donn), 10.2–44; **Summer precipitation variation, W. Germany** (Dammann), 10.2–289.

10.2–312 551.583.3:551.526.6

Yalkovsky, Ralph, **The relationship between paleotemperature and carbonate content in a deep-sea core.** *Journal of Geology*, Chicago, 65(5):480–496, Sept. **1957.** 4 figs., 2 tables, refs. **DWB**—A core taken at 4160 m depth in the Caribbean was spectrochemically analyzed for carbonate content. Results of the analysis are compared with paleotemperature data for the same core. No correlation is found to exist between carbonate content and temperature. This is attributed to the fact that high temperatures prevailed in the investigated part of the Caribbean throughout the Pleistocene, and temperature, therefore, was not a minimal or controlling factor in carbonate production. *Subject Headings:* **1. Pleistocene temperature 2. Deep sea sediments 3. Caribbean.**—*G.T.*

MICROCLIMATOLOGY

See also: **Microclimate of shelterbelts** (Caborn), 10.2–20; **Rice seedlings** (Mihara, Ōnuma), 10.2–94; **Phenology of forests, Coast Range, Northwest Oregon** (Macnab), 10.2–97; **Altitude effects on precipitation, Dunedin District, N. Z.** (Wardle, Mark), 10.2–98.

10.2–313 551.584.3(478) 551.43/45

†Mozeson, D. L., **Osnovnye tipy zapadinnogo mikrorel'efa Volgo-Ural'skogo mezhdurech'ia i ego genezis.** [Basic types of sunken microrelief in the region between the Volga and Ural Rivers and their genesis.] *Akademiia Nauk SSSR. Institut Geografii, Trudy*, No. 69:37–92, **1956.** 20 figs. (part fold.), 13 tables, 41 refs. **DLC**—In this discussion of the structure of the microrelief of the Volga and Ural regions, three types are differentiated, namely: deeply depressed relief, flat depressed type and the moderately depressed type. In each of these types of microrelief, the author discusses the distribution of precipitation, the soil moisture, the distribution of surface runoff, etc. Data are given on the height and density of the snow cover, snow reserves, etc. *Subject Headings:* **1. Microrelief classification 2. Hydrometeorology of Volga-Ural regions 3. Volga-Ural regions.**—*I.L.D.*

10.2–314 551.584.43:577.4

Aulitzky, H., **Über Bedeutung und Grenzen der ökologischen Klimatographie unter besonderer Berücksichtigung der subalpinen Stufe der Innenalpen.** [The importance and limitations of ecoclimatography classification with special consideration of the subalpine level in the interior of the Alps.] *International Journal of Bioclimatology and Biometeorology*, Leiden, Vol. 1 (Pt. 2, Phytological Bioclimatology), **1957.** 3 p. 10 figs. **DWB**—Ecological climatography is defined as the exact determination of the microclimatic indicators of plants and animals. The determination of microclimatic indicators involves the measurement of temperature conditions, etc., at the plant level in relation to limiting and optimal conditions of plant life and also such biological responses as plant distribution limits, physiological reactions of individual plants to microclimatic conditions, etc. The application of these principles to a mountainous region where microclimatic conditions are most heterogeneous is illustrated by means of the specific example at the most continental point of the Eastern Alps on the western and eastern slopes of the Utz Valley at heights of 1800–2400 m. The microclimatic conditions to which plants are subjected to during their life cycle are discussed in detail with the aid of graphs showing the daily variations of soil temperature, duration of soil temperatures, an ecogram which summarizes all the essential biotic relationships to climatic

elements, etc. *Subject Headings:* **1. Ecoclimatography 2. Plant microclimatology 3. Eastern Alps.**—*I.L.D.*

10.2–315 551.584.5:551.578.46(436.14)

Fischer, P. Leander, **Der winterliche Strassenzustand, beobachtet in Wien 1., Schottengasse und Helferstorferstrasse.** [Winter street conditions observed in Vienna 1., Schottengasse and Helferstorferstrasse.] *Wetter und Leben*, Vienna, 9(3/5):58–62, **1957.** table. **DLC**—Table and graphs showing the conditions of Vienna streets in winter are presented for four winters, namely the winters of 1953–54, 1954–55, 1955–56 and 1956–57. The snowfall and ice conditions for each winter are described, the individual winters are compared, and the frequencies of individual street conditions are presented in a table. *Subject Headings:* **1. Winter street conditions 2. Snowfall data 3. Vienna, Austria.**—*I.L.D.*

10.2–316 551.584.65

Hutchison, Victor H. (*Duke Univ., Durham, N. C.*), **The distribution and ecology of the cave salamander, *eurycea lucifuga*.** *Ecological Monographs*, Durham, N. C., 28(1):1–20, Jan. **1958.** 13 figs., 10 tables, 73 refs. **DLC**—Field and laboratory studies reveal temperature, humidity, precipitation, wind (air movement) and light changes which affect caves, and especially cave salamanders, in the Williams Cave and Lucas Cave areas of the Virginia Appalachians (Giles County, Va.). Three caves were used as controls and 4 as "study caves." Elevations ranged from 1800–2100 ft. Detailed temp., precip., evaporation and saturation deficit curves and data are presented and discussed. *Subject Headings:* **1. Cave micrometeorology 2. Giles County, Va.**—*M.R.*

CLIMATIC CLASSIFICATION

See also: **Econ. and social geog.** (Ekblaw, Mulkerne), 10.2–6.

10.2–317 551.585:551.582(67:728.7–52)

†*Blair, Walter Beale, **Analogs of Canal Zone climate in East Central Africa.** *U. S. Quartermaster Research and Engineering Center. Environmental Protection Research Div., Technical Report*, EP-90; Canal Zone Analogs, 3, June **1958.** 24 p. 15 maps (col., fold.), 9 tables, 26 refs. **DWB** (M86 U585t)—The climate of East Central Africa is compared with that of Balboa Heights and Cristobal in the Canal Zone. Distributions of areas of analogy of pertinent climatic elements and combinations of these elements are shown on maps. Most of the study area is too hot and too dry for analogy with the tropical environment of the Canal Zone. No part of the study area has enough rainfall to be comparable with Cristobal. The one area that is closely analogous to Balboa Heights is in the Congo Basin, west of long. 30°E and south of lat. 7°N. The amount of rainfall analogous to that of Balboa Heights is limited mostly to the southwestern part of the study area. Highlands in Kenya, Uganda, and Ethiopia are the only areas which are too cool for analogy with either Canal Zone station. Relative humidities in most of the desert and interior regions are too low for analogy. However, some areas near the Gulf of Aden, Indian Ocean, Lake Victoria, and the Congo River, are either analogous or are too high for analogy. Areas with greatest mean monthly precipitation have mean cloudiness conditions nearly analogous to the Canal Zone. Analogy of mean wind speeds with those in the Canal Zone is erratically scattered throughout East Central Africa. *Subject Headings:* **1. Climatic analogs 2. Climate of Central Africa 3. Climate of Canal Zone 4. Central Africa 5. Canal Zone.**—*Author's abstract,*

10.2–318 551.585(529)

*Chen, Cheng-Siang, **Climatic classification of Taiwan.** *Meteorological Bulletin*, Taipei, Formosa, 3(2):1–9, June **1957.** 10 tables. In Chinese: English summary p. 1. **DLC** (Orientalia)—Compared with those in other provinces of China, climatic data in Taiwan are not only the richest, but also the most reliable. The systematic meteorological observation in Taiwan was started in 1897 and by 1952 climatic records in seven locations had covered a fairly long period of 50 yrs. All the temperature records of the hundred stations dealt with in this paper have covered more than 10 yrs and the rainfall records have covered at least 20 yrs.

The author feels that THORNTHWAITE's new system can be roughly adapted to the actual conditions in Taiwan and, viewed from the results thus obtained, is far more reasonable than KÖPPEN's system to Taiwan in that its definition of the Cia climate is not fitted to the distribution of the field crops and natural landscapes on this island. By using THORNTHWAITE's 1948 classification, one is able to discern, with fair satisfaction, the regional climatic differences which resulted from peculiar topography and their limitations laid on the distribution of crops and forests by the regional climatic differences. The distribution of sugarcane in Taiwan is almost entirely limited to the BA′ climate, that of tea plantations generally to the BB′ climate, and that of hardwoods forest and a part of the tea gardens in the northeast of the island to the AB′ climate. The author is particularly satisfied with the Pescadores being classified as C_1 A′da′ climate, for he is of the opinion that the natural vegetation of these windy islands doubtlessly belongs to the same category as that of grass land. *Subject Headings:* **1. Climatic classifications 2. Thornthwaite's classification 3. Formosa.**—*Author's abstract.*

10.2–319 551.585:63

Selianinov, G. T., **Klassifikatsiia klimatov na proizvodstvennoĭ osnove.** [Climatic classification from the point of view of agricultural productivity.] *Vsesoiuznoe Geograficheskoe Obshchestvo, Leningrad, Izvestiia,* 89(3):225–229, May/June **1957.** 5 refs. **DLC**—A. I. KAIGORODOV's "natural climatic classification" is examined critically and found to be one-sidedly based upon the purely physical basis of climate. While it takes into account biological factors such as in the system of KÖPPEN, it implies subjective estimates of climate, the latter not being objectively evaluated. In contrast to this purely physical classification of climate, the author presents the agricultural classification of climate which takes into account not only the radiational balance according to the type of atmospheric circulation generally characteristic of each climatic zone but also the productive values of climatic phenomena. The method of classification proposed by the author involves the use of the sum effective temperatures that correspond better to the geography of cultivated plants than the sum of solar radiation. The fundamental temperature sum is the sum above 10°C, since that is used by most cultivated plants. The use of this concept, the inclusion of day length, moisture balance, snow cover, etc. in the classification of climates on the basis of agricultural productivity is illustrated. *Subject Heading:* **1. Agricultural climatic classification.**—*I.L.D.*

BIOCLIMATOLOGY

See also: **Solar radiation-air conditioning manuals, Calcutta, India** (Groundwater), 10.2–24; **Agrometeorological and balneological conf., Khutzuban, Kobulety District, U.S.S.R.,** 10.2–59; **Potato and corn yields** (de Ferrière), 10.2–91; **Temp. effects on silkworms** (Yamazaki et al.), 10.2–92; **Cooling degree days, U. S.** (Thom), 10.2–103; **Rectal thermometers** (Breckenridge), 10.2–106; **Health resorts** (Trauner, Goldberg), 10.2–107; **Comfort zones** (Berg), 10.2–108.

10.2–320 551.586:612.014.4

Falkowski, Sigmund J. and Hastings, Andrew D., Jr., **Windchill in the Northern Hemisphere.** *U. S. Quartermaster Research and Engineering Center, Natick, Mass. Environmental Protection Research Div., Technical Report* EP-82, Feb. **1958.** 9 p. map (fold.), 4 tables, 11 refs. **DWB** (M86 U585t)—Wind chill is defined as the cooling power of wind and temperature combinations on shaded, dry human skin. It is measured in kilogram calories of heat loss per square meter of exposed skin surface per hour for each Centigrade degree of temperature difference between the skin and the ambient air. The report points out the usefulness of the wind chill index in assessing relative human comfort as well as its limitations with respect to evaporation and radiation influences. Tables simplifying computation of the index are included. These tables list temperature and wind speed factors derived from the wind chill formula, converted from metric to English units for temperatures from 90°F to −105°F, and for wind speeds from 0 to 45 mph. Any pair of these factors applicable to a given situation may be multiplied directly to yield the wind chill index. A map of the Northern Hemisphere shows the mean wind chill distribution for the coldest month of the year, using isopleths at intervals of 100 units of wind chill, from 500 to 2100 kg cals/m²/hr. Values were derived

from monthly means of temperature and wind speed from more than 1000 stations. *Subject Headings:* **1. Wind chill 2. Wind chill formulas 3. Comfort indexes 4. Northern Hemisphere.**—*Authors' abstract.*

10.2–321 551.586:612.46

Flad-Schnorrenberg, Beatrix Maria, **Experimentelle Untersuchungen über die Wasserausscheidung des Goldhamsters und ihre Beeinflussung durch meteorologische Vorgänge.** [Experimental investigations on the excretion of water by the golden hamster and the effects thereon of meteorological processes.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B*, Vienna, 8(3/4):407–430, **1957.** 11 figs., 6 tables, 35 refs. **DLC**—The urine secretion of six golden hamsters was studied over a period of 2½ yrs, both during summer and winter. During the latter season, temperature and relative humidity remained constant; only pressure varied. The golden hamsters showed a diurnal rhythm in the secretion of urine with a maximum at night and a minimum by day; an actual seasonal influence upon urine secretion could not be demonstrated. When the daily variations were excluded, the daily urine secretion showed variations that were unrelated to any rhythm. The relationship between the urine excretion and weather is analyzed by the method of differential analysis which relates urine excretion to individual weather elements, and by the method of schematic synthesis, which relates the physiological process to the total weather situation. No direct relationship could be established between air temperature, relative humidity, barometric pressure, sunshine duration, cloudiness and rainfall, and daily urine excretion. In the case of atmospheric electricity elements it was found that a relationship exists between urine secretion and "infralongwave disturbances," especially waves with 5 to 12 kHz. Air masses and fronts seemed to reduce urine excretion. Using UNGEHEUER's weather typization scheme, the author related daily urine excretion to various weather phases and found a statistically valid relationship which showed an increased secretion of urine during weather phases 4 and 5 (beginning weather changes and completed weather change) and a reduction in secretion during weather phase 3 (föhn-like extreme good weather). The basis of this relationship is the intensification of disturbances on the electromagnetic infrared region. The alternation between weather influenced by diurnal rhythmic variation of radiation and that determined by aperiodic superimposed advection influences the organism. The point of influence of weather on the organism is discussed. *Subject Headings:* **1. Biometeorology 2. Temperature effects on urine excretion.**—*I.L.D.*

10.2–322 551.586:613.1(728.4)

†Dieterichs, Heinz, **Dauer und Häufigkeit schwüler Stunden in San Salvador, C. A.** [Duration and frequency of sultry periods in San Salvador, Central America.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B*, Vienna, 8(3/4):369–377, **1957. DLC**—On the basis of 4 yrs' record (1952–1956) of atmospheric temperature and relative humidity at the climatic station of the University of San Salvador, the author investigated the duration and frequency of sultry periods, sultriness being defined by a vapor pressure tension of 14.08 mm Hg and greater. The sultriness data for San Salvador were compared with those for Potsdam. San Salvador has an annual average of 5858 sultry hours as compared with 146 for Potsdam. As in Potsdam, periods of one hour are most frequent in San Salvador. In the latter, the longest sultry period was 1585 hours as compared with 45 hours in Potsdam (in 15 yrs). Also, the annual variation of sultry periods, the annual variations of sultry frequencies, and the diurnal variation of sultry frequencies are analyzed and compared for the two localities. Data are presented on the frequency of sultry periods in San Salvador (1952–1956), mean monthly number of sultry hours in Potsdam and in San Salvador, etc. *Subject Headings:* **1. Sultriness data 2. San Salvador.**—*I.L.D.*

ENVIRONMENTAL INFLUENCES

See: **Isobaric surfaces, Rocky Mts.** (Kawata), 10.2–148; **Rainfall intensities-topography relationships, Northern Calif.** (Linsley), 10.2–291; **Rainfall intensities-topography relationships, Northern Calif.** (Linsley), 10.2–292; **Forest influences on snow cover, Kamabutchi Forest Station, Japan** (Shidei), 10.2–305.

DYNAMIC AND SYNOPTIC CLIMATOLOGY

See also: **Climate of Northice, Greenland** (Hamilton), 10.2–40; **Monthly mean upper air charts, Japan** (Yamada et al.), 10.2–165.

10.2–323 551.589:551.582(459.1)

*†Serra, Antonio, **Introduzione allo studio della climatologia dinamica della Sardegna, Pt. 1, Frequenza delle principali masse d'aria e dei venti associati.** [Introduction to the study of dynamic climatology of Sardinia, Pt. 1, Frequency of the principal air masses and associated winds.] *Rivista di Meteorologia Aeronautica*, Rome, 18(1):3–28, **1958.** 6 tables, 4 figs. Italian, French, English and German summaries p. 3. **DLC**—Based on observations at 8 stations (1941–55), the duration, frequency, and characteristics of various air mass types and attending winds and weather on the east and west coast of Sardinia (and for one station in the interior) are analyzed and discussed. Detailed tabulations and graphs, charts, etc. of the statistical synoptic (dynamic) climatology type are included. The literature on the subject and for the area is well reviewed. Polar air predominates in Jan.; Mediterranean air, in July. *Subject Headings:* **1. Climate of Sardinia 2. Synoptic climatology of Sardinia 3. Air mass climatology 4. Sardinia.**—*M.R.*

MISCELLANEOUS

COSMIC INFLUENCES

See also: **X-rays emitted during solar eclipses** (Elwert), 10.2–169.

10.2–324 551.590.21:541.18

Piccardi, Giorgio, **L'estensione delle ricerche coi test chimici in diverse parti della terra.** [Extension of research by chemical tests to various parts of the world.] *Geofisica e Meteorologia*, Genoa, 5(1/2):11–13, Jan./April **1957.** 2 figs., 4 refs. **DWB**—Reactions of the chemical test which utilizes the precipitation of bismuth oxychloride in the colloidal state, followed by its flocculation and sedimentation, are correlated with solar activity. During the last years of the old solar cycle (1951, 1952, 1953) the reactions of test F in the free atmosphere varied in an opposite sense to those of the same test, namely, test D, under a copper screen. During the first years of the new solar cycle (1954, 1955, 1956 and part of 1957) the course of test D reactions has continued unchanged where that of F has begun to run parallel to that of D showing a minimum at the spring equinox. This is explained by the fact that every 11 yrs the magnetic polarity of the sunspots inverts itself and, simultaneously, the asymmetry between the two hemispheres of the sun becomes inverted. The annual variation of test D is described, and a list of the stations where chemical tests are being made is given. *Subject Headings:* **1. Solar influences on precipitation of chemicals 2. Bismuth oxychloride precipitation.**—*I.L.D.*

10.2–325 551.590.25:621.396.9

North Atlantic Treaty Organization. Advisory Group for Aeronautical Research and Development (AGARD), **Papers presented at the Ionospheric Research Meeting, The Hague, Netherlands (July 1–3, 1957).** Ed. by Tor Hagfors. *AGARDograph*, Paris, No. 26, July **1957.** 69 p. figs., tables, refs. **DWB** (629.1322 N864a)—Physical problems of importance in meteor communication are discussed and the information capacity of the JANET system is evaluated theoretically. Experimental results on properties of meteor signals are presented. The Canadian JANET system is described and some operational results are given. Interference problems encountered in scatter communication are reviewed. Experimental results on the artificial production of electron clouds are presented and new communication possibilities are proposed. A collection of eight papers presented at the Ionospheric Research Meeting at the Hague, Netherlands, July 1957. *Subject Headings:* **1. JANET system 2. Meteor communications.**—*Author's abstract.*

10.2–326 551.590.25:551.510.535:551.510.62

Pineo, V. C., **Experimental observations of the contribution of meteoric ionization to the propagation of VHF radio waves by ionospheric forward scatter.** *U. S. National Bureau of Standards, NBS Report*, 5544, Dec. 19, **1957.** 6 p. 7 figs., 10 refs., eq. **DWB**—The experimental results described in this paper were obtained during the month of Jan. 1956. Cedar Rapids, Iowa, transmissions at 49.8 Mc/s beamed towards Sterling, Va., were recorded simultaneously at Sterling and at two off great-circle path receiving sites, one northerly from Sterling at Shepherdstown, Pa., and the other southerly from Sterling at Carysbrook, Va. Identical rhombic antennas beamed towards the midpoint of the Cedar Rapids to Sterling path were used at each receiving site. Signal intensities at Carysbrook were greater than at either Sterling or Shepherdstown from 0400 hrs to 1115 hrs. Sterling signal intensities were greater than at either Shepherdstown or Carysbrook from 1115 hrs to about 1715 hrs. Shepherdstown signal intensities were greater than at either Sterling or Carysbrook from 1715 hrs to 0400 hrs. Signal intensities at each site reached maximum values during the midday hours. These results indicate that there are two principal propagation modes involved in ionospheric scatter propagation, one due to solar influence, the other due to meteoric ionization. *Subject Headings:* **1. Ionospheric scattering 2. Meteoric ionization 3. VHF radio wave propagation.**—*Author's abstract.*

VISIBILITY

10.2–327 551.591.7:535.314

Duntley, Seibert Q.; Boileau, Almerian R. and Preisendorfer, Rudolph W. (*all, Scripps Inst. of Oceanog., Univ. of Calif., La Jolla*), **Image transmission by the troposphere, Pt. 1.** *Optical Society of America, Journal*, 47(6):499–506, June **1957.** 10 figs., 11 foot-refs., 19 eqs. **DWB, DLC**—A specially equipped B-29 airplane was used to obtain optical transmittance data from 18,000 ft to 1000 ft above sea level over Florida. The resulting data are shown in several profiles of path function, equilibrium luminance and attenuation length, so that the transmittance of any inclined path of sight having a maximum altitude of 1000 to 18,000 ft can be calculated. At the same time, an USAF C-131 equipped with a microwave refractometer flew in formation with the B-29 during descent and obtained data from which the humidity (dew point) could be calculated. The profiles of dew point (refractive index) show a strong correlation with the path function profile. Temp. is also shown. Variations are interpreted in terms of nuclei in aerosol. *Subject Headings:* **1. Optical transmission profiles 2. Air-borne refractometer measurements.**—*M. R.*

OPTICAL PHENOMENA

See also: **Arctic research projects, Thule, Greenland,** 10.2–41; **Spread F variations** (Briggs), 10.2–168; **Thunderstorm and optical phenomenon data, Netherlands,** 10.2–209; **Refractive index in infrared** (Schlueter, Peck), 10.2–215.

10.2–328 551.593

Meyer, Rudolf, **Besondere atmosphärisch-optische Erscheinungen.** [Special atmospheric-optical phenomena.] (In: Linke, Franz, **Linkes Meteorologisches Taschenbuch.** New ed. Leipzig, **1957.** 3:40–61. 3 figs., refs.) **DLC** (QC864.L53)—Rainbows, halos and allied phenomena, refraction phenomena, coronas, shadows and miscellaneous optical phenomena are explained and illustrated and the basic laws discussed. *Subject Headings:* **1. Optical phenomena 2. Halos 3. Mirages 4. Rainbows.**—*M. R.*

10.2–329 551.593

Minin, I. N. (*Voeĭkov Geophys. Obs.*), **O svetovom rezhime v mutnoĭ srede.** [The light regime in a turbid medium.] *Akademiia Nauk SSSR, Izvestiia, Seria Geofiz.*, No. 5:617–619, May **1956.** 8 refs., 7 eqs. **DLC**—The investigations of the light regime in the earth's atmosphere, in the ocean, etc. necessitates a knowledge of the intensity of illumination at any point within a turbid medium. In this article the author analyzes mathematically the problem of

the light regime within a semiinfinite layer of a turbid medium, at the periphery of which a given intensity of illumination impinges as a parallel bundle of rays. *Subject Heading:* **1. Atmospheric optics.**—*I.L.D.*

10.2–330 551.593.1:535.4

Penndorf, Rudolf B. (*AVCO Manufacturing Corp., Boston, Mass.*), **Total mie scattering coefficients for spherical particles of refractive index n∼1.0.** *Optical Society of America, Journal*, 47(7):603–605, July **1957.** fig., 3 tables, 3 foot-refs., 10 eqs. **DWB, DLC**—The total Mie scattering coefficient K for $n \sim 1.0$ has been computed for the normalized size parameters $\rho = 0(0.2)15(0.5)17$ and for the first ten maxima and minima up to $\rho = 64$. Furthermore, a formula for the position of the extrema is derived and the results of the computations are listed. For large ρ the total Mie scattering coefficient can be represented by a simple sine function with steadily decreasing amplitude. (*See also* 9.10–4, Oct. 1958, *MAB.*) *Subject Headings:* **1. Refractive index 2. Mie scattering coefficients.**—*Author's abstract.*

10.2–331 551.593.12:621.396.8:523.8

Koster, J. R. (*Univ. College of Ghana, W. Africa*), **Radio star scintillations at an equatorial station.** *Journal of Atmospheric and Terrestrial Physics*, London, 12(2/3):100–109, **1958.** 4 figs., 4 tables, 10 refs. **DLC**—Radio star scintillations have been observed at a frequency of 45 Mc/s over a period of 4 yrs at an equatorial station with a phase switching interferometer. Scintillation effects are found to be very severe, the output from even intense radio stars often dropping to zero. Scintillation occurs only at night, and is of nearly daily occurrence near sunspot maximum, correlating positively with the sunspot cycle. It correlates highly with the occurrence of spread F echoes, but with no other geophysical phenomena. It is as yet unclear whether the observed results are due to absorption of the signal or can be accounted for by the impression of a much larger phase deviation on the emergent wave front by the diffracting screen responsible for scintillation. The phenomenon correlates highly with the transequatorial scatter of radio signals observed near sunspot maximum. *Subject Headings:* **1. Radio star scintillation 2. Sunspot maxima.**—*Author's abstract.*

10.2–332 551.593.12

Meyer, R., **Probleme der atmosphärischen Schlieren.** [Problem of atmospheric striation.] *Frankfurt a.M. Universität. Meteorologisch-Geophysikalisches Institut, Bericht*, No. 6:50–54, **1956.** 21 refs. **DWB** (M055P578b)—The rapidly changing disturbances in the propagation of light are attributed to striation, that is, to atmospheric elements which differ in density from surrounding air at the same height chiefly as a result of variable temperature distribution. The role of atmospheric situations in the phenomenon of scintillation is discussed with reference to the refraction and bending theories of scintillation. The study of striation by means of the scintillation of terrestrial sources and the application of the results obtained to the free atmosphere is considered. The relationship of flying shadows to striation, the role of wind in the movement of flying shadows and characteristics are discussed. *Subject Headings:* **1. Atmospheric striation 2. Scintillation.**—*I.L.D.*

10.2–333 551.593.7:551.510.62

Sekera, Z. (*Dept. of Met., Univ. of Calif., L. A.*), **Light scattering in the atmosphere and the polarization of sky light.** *Optical Society of America, Journal*, 47(6):484–490, June **1957.** 7 figs., 7 foot-refs., 2 eqs. **DWB, DLC**—The characteristic properties of scattered light in the atmosphere can be derived from the equations of radiative transfer, conveniently formulated in terms of four Stokes polarization parameters. For the case of Rayleigh scattering by a method outlined by CHANDRASEKHAR, it is possible to obtain an exact solution of this equation in the sense that the effect of all orders of scattering is included. With the use of this method, the intensity and the polarization of the diffuse sky radiation in a pure, molecular atmosphere were computed. These theoretical values are compared with the results of measurements of sky light polarization, performed by means of a new photoelectric polarimeter specially constructed for such measurements. The deviations of the observed sky light polarization from that of a molecular atmosphere are discussed with respect to the degree of atmospheric turbidity. These deviations show a systematic character which can be deduced already from the

orm of the equation of radiative transfer for a turbid atmosphere. The method of solving he problem of radiative transfer for a turbid atmosphere is outlined, with emphasis on the ossible determination of the type of scattering from the measurements of sky light polarization. *ubject Headings:* **1. Sky light polarization 2. Scattering of light.**—*Author's abstract.*

ELECTRICAL PHENOMENA

See also: **Atmospheric electricity textbooks** (Kilinski), 10.2–9; **Static electrification** (Loeb), 10.2–11; **Auroral observation in Antarctica** (Gartlein), 10.2–49; **Ionization measurement by rockets** (Spencer, Boggess), 10.2–133; **Constituents of earth's atmosphere** (Storey), 10.2–155; **F layer ionization** (Ferraro, Özdoğan), 10.2–170; **Electrical theory of tornadoes** (Vonnegut), 10.2–207; **Thunderstorm and optical phenomenon data, Netherlands,** 10.2–209; **Crystalline and freezing nuclei** (De Bernochi), 10.2–264.

10.2–334 537.226.2:551.594.1

Hughes, J. V. and Lavrench, W., **The permittivity of air at a wavelength of ten centimeters.** *Institute of Radio Engineers, Proceedings,* 39(7):839, July **1951.** fig., ref., eq. **DLC**—Brief description and block diagram of equipment used to measure the dielectric constant f dry air. The mean value at S.T.P. was $(K-1)\times10^6=606$, consistent with W. E. PHILLIP's esult. *Subject Heading:* **1. Dielectric constants.**—*W.N.*

10.2–335 551.594.11:551.508.822

Venkiteshwaran, S. P. and Huddar, B. B. (*both, Met. Off., Poona*), **Variation of electrical otential gradient with height at Poona from October 31 to November 2, 1953.** *Indian Journal f Meteorology and Geophysics,* Delhi, 7(1):61–64, Jan. **1956.** 5 figs., 4 refs. **DWB, DLC**—Balloon flights were made daily at 2000 IST at Poona from 30 Oct. to 2 Nov. 1953 to determine he potential gradient up to Ca. 100 mb. An American type (U. S. Signal Corps) radiosonde nd receiver (audio frequency modulation) of 4 m was used for the electrometer (HL33 tubes) nd an F type (Indian) receiver for the pressure, dry and wet bulb temp. The potential radient increased sharply just above the ground to nearly 600 V/m and then rapidly decreased bove 850 mb (4760 ft), although on Oct. 30 the high values extended up to 660 mb (11,200 ft). n the upper dry air mass (min. at 750–700 mb) the potential gradient was 30–50 V/m and hese low values extend up to 100 mb. Variations are ascribed to fog near ground. Examples f adiabatic charts and of a potential gradient recorder record (for Oct. 31) are included. Distance between polonium collectors was 50 cm. (Earlier records (Feb.–Mar. 1953) are ublished in 5.8–275, Aug. 1954, *MAB*; for a description of the equipment, *see* 5.1–307, Jan. 954, *MAB.*) Also, *see* 9.2–152, Feb. 1958, *MAB* for further records at Poona. *Subject leadings:* **1. Electrical conductivity of air 2. Radiosonde electrical conductivity soundings . Potential gradient measurements 4. Poona, India.**—*M.R.*

10.2–336 551.594.12:551.510.62

Coroniti, S. C. and Gerson, N. C., **Scatter-field strengths and large ion concentration.** *ournal of Atmospheric and Terrestrial Physics,* 10(4):237–239, **1957.** fig., 5 refs. **DWB**—ield strength well beyond horizon at 100–4000 mc/s varies only slightly with distance. To xplain this, the concentration of large ions N_+ was compared with modified refractive N. rom 2000–10,000 ft $N=210+0.13\ N_+$. *Subject Headings:* **1. Radio propagation beyond the orizon 2. Ion concentration.**—*C.E.P.B.*

10.2–337 551.594.12:551.510.535

. Krasovskiĭ, V. I., **Ob effektivnom koeffitsiente rekombinatsii v ionosfere.** [Effective oefficient of recombination in the ionosphere.] *Akademiia Nauk SSSR, Izvestiia, Ser. eofiz.,* No. 4:504–511, **1957.** 14 refs., 31 eqs. **DLC.** Trans. into English by R. E. Bailey the English language edition of the **Izvestiia,** *Bulletin of Academy of Sciences of the U.S.S.R., eophysics Series,* No. 4:103–110, **1957,** issued by the American Geophysical Union. **DWB**—is shown that in the ionosphere the exchange reaction O^+ with N_2 leads to the formation of O^+ ions. This explains the observed significance of the effective coefficient of recombination

which is inversely proportional to the electron density and the ionizing radiation. The exchange reaction with the participation of ions and the recombination of molecular ions is accompanied by the dissociation of molecular nitrogen. At night the F_2 layer may exist at the expense of electrons which are retained in the exosphere and which are formed by day in the lower layers and the small effective recombination coefficient in this region. The coefficient of effective recombination increases under the action of infrared waves. *Subject Headings:* **1. Recombination coefficient 2. Nitrogen dissociation 3. F layer ionization.**—*Trans. of author's summary* (*I.L.D.*).

10.2–338 551.594.22:621.316.98

Long, Arthur R.; Pate, Floyd C. and Crosby, Rufus O. (*all, B. B. Airport Station, Montgomery, Alabama*), **Lightning damages in Alabama.** *U. S. Weather Bureau, Weekly Weather and Crop Bulletin*, 43(16):7–8, April 16, **1956.** fig., table. **DWB, DLC**—A comparative and descriptive record of the lightning damages in Alabama, 1944–1953, and the protective measures against lightning are given. *Subject Headings:* **1. Lightning damage 2. Lightning protection 3. Alabama.**—*N.N.*

10.2–339 551.594.221:779

†Szpor, S. and Kotłowski, J., **Series of photographic studies on lightning and air discharges.** *Acta Geophysica Polonica*, Warsaw, 6(1):18–31, **1958.** 9 figs., 45 refs. **DWB, DLC**—Double moving-film cameras are described, with which lightning flashes and air discharges are recorded in Poland. Some photographs obtained in the northern district of Wejherowo are reproduced and discussed. Records of air discharges show either minuscule discharge branches or principal trunks. Abrupt strokes and long-duration phenomena occur. Some abrupt strokes resemble main strokes of lightning flashes. Photographs frequently reveal relations of lightning strokes to earth with precedent air discharges. A record of lightning series shows three strokes along different paths to ground, with a pause of only 0.037 s before the second stroke, and two other strokes are probable. Photographs of a multiple lightning flash represent three bright strokes and two faint components, which follow the two subsequent bright strokes after similar time intervals of 0.005 s and are associated with some discharges in an upper region of the thunder cloud. The records seem to indicate a local preponderance of single lightning flashes and a frequent occurrence of total times above 1 s. Theoretical interpretations take account of the charge distributions and of the potentials along the discharge channels. Abrupt strokes of air discharges are explained as resulting from the junction of previously formed channels. A sequence of air discharges and of lightning strokes to earth is interpreted in relation with the changes in the potentials of the channel system. These changes also explain the choice of new paths to earth for subsequent strokes of a lightning series. Similar theoretical elements are used to throw some light on the problem of long total times. *Subject Heading:* **1. Lightning photography.**—*Authors' abstract.*

AURORAS

10.2–340 523.77:551.594.5:551.521.3

Hunten, D. M. (*Univ. of Saskatchewan, Saskatoon*), **Recent work at the University of Saskatchewan on auroral and night sky spectra.** *Annales de Géophysique*, Paris, 14(2):167–173, April/June **1958.** fig., 19 refs. French and English summaries p. 167. **DLC**—Some of the work of the past three years in spectroscopy of aurora and airglow at Saskatoon and also at Churchill is reviewed. Measurements of rotational temperature of the N_2^+ band at 3914 Å are consistent with the expected gradient of 6°/km; this is true at Churchill as well. Spectral features observed include several bands of the N_2^+ Meinel system: (0.0) at 11,100 Å and (0.1) and (1.2) near 15,000 Å. The (1.0) and (1.2) bands often have anomalously high intensity; it may be that they are excited preferentially by collision with O^+ (^2D). Hydrogen lines appear further south in the stronger auroral displays, but other predictions of the Marty theory are not confirmed. OH bands in the airglow have been observed out to 20,000 Å; the intensity of the (4.2) band has been measured as 175 kilorayleighs and the rotational temperature as 200°K. *Subject Headings:* **1. Auroral spectroscopy 2. Airglow spectroscopy 3. Rotational temperature measurements 4. Saskatoon, Canada.**—*Author's abstract.*

10.2–341 551.594.5:551.501.8

Seed, T. J. and Ellyett, C. D. (*both, Canterbury Univ. College, Christchurch, New Zealand*), **ow latitude reflections from the aurora australis.** *Australian Journal of Physics*, Melbourne, 1(1):126–129, March **1958.** 2 figs., table, 5 refs. **DLC**—A search for auroral reflections ith a radar (or pulse radio transmitter) was begun in March 1957 at the Canterbury Univ. ollege Radio Observatory, 14 mi from Christchurch, N. Zealand (lat. 43.6°S, long. 172.6°E nd 47.8°S geomagnetic lat.). Echoes were obtained at Christchurch on March 10, 1957 or 3 hrs (13–16 h) at 325–500 km range and 116–165 km height. The aurora was observed isually over S. New Zealand, Campbell Island and Australia earlier, and over all of New ealand from 13–14 h, and in Australia 16–1630 h. Another radar display was observed on pril 10. It is correlated with visual and magnetic data on a graph and was calculated to ome to within a distance of 250 km and 93 km height. The beginning of the radar return oincided with a steep gradient on the magnetogram. A total of 10 auroras were thus oberved in 61 days (April 10–June 10) and the data are tabulated. *Subject Headings:* **1. Radar bservation of auroras 2. Aurora australis 3. Christchurch, New Zealand 4. Australia.** *-M.R.*

10.2–342 551.594.51:546.17

†Roesler, F. L.; Fan, C. Y. and Chamberlain, J. W. (*all, Yerkes Observ., Williams Bay, Visc.*), **Interpretation of rotational temperatures of auroral N_2^+ bands, Pt. 1, Proton impact t intermediate energies.** *Journal of Atmospheric and Terrestrial Physics*, London, 12(2/3): 00–205, **1958.** 2 figs., 20 refs., eq. **DLC**—Laboratory experiments have been performed to nd the rotational temperature of the first negative bands of N_2^+ when nitrogen is excited by roton collisions at energies between 10 and 30 keV. In this range there is little difference etween the gas temperatures and the apparent (rotational) temperatures obtained by proton xcitation. The question of the correspondence between auroral N_2^+ temperatures and the as temperatures in the high atmosphere is reviewed. In spite of the agreement reported ere, the matter is still not definitely settled. For a confident interpretation of auroral N_2^+ and structure, further experimental work is required. *Subject Headings:* **1. Rotational temeratures 2. Auroral nitrogen bands 3. Auroral zone temperatures.**—*Authors' abstract.*

SFERICS

10.2–343 551.594.6:551.508.86

Delloue, Jean, **Sur la direction d'arrivée et la polarisation des atmosphériques siffleurs.** Direction of incidence and the polarization of whistling atmospherics.] *Académie des ciences, Paris, Comptes Rendus*, 244(6):797–799, Feb. 4, **1957. DLC**—An apparatus used or selective observation of whistling atmospherics is described. Observations made with the pparatus show that whistling atmospherics always come from a direction close to that of the eomagnetic field. The direction of an individual whistler varies simultaneously with its olarization. The existence in the high atmosphere of very small ionized regions of short uration was ascertained. *Subject Headings:* **1. Whistling atmospherics 2. Radio noise Sferics 4. Whistler polarization 5. Whistler recorders.**—*Trans. of author's abstract.*

PART II. ANNOTATED BIBLIOGRAPHY ON TORNADO ANALYSIS AND FORECASTING

By: *Geza Thuronyi*

INTRODUCTION

Several new techniques developed in recent years, such as radar, sferics location and mesoscal synoptic analysis, appear to hold some promise in their applications to tornado analysis and forc casting. It is the purpose of this bibliography to organize the literature in which preliminary result achieved with these and other techniques are evaluated. In selecting the material to be include in this compilation, emphasis was placed upon papers dealing with theoretical aspects of tornad formation. A number of accounts of individual tornadoes was included, however, if they containe thorough descriptions of the synoptic situation involved. Moreover, a few papers containin statistical material on tornado occurrence and characteristics were included for their interest a background material.

A detailed index to the various subjects covered will be found in the Outline of Contents belov

The period covered is 1950–1958. Earlier literature was the subject of a previous bibliograph published in the May 1950 issue of **Meteorological Abstracts** (*see* 10B–4).

This bibliography was prepared for and with support from the U. S. Weather Bureau. W wish to express our appreciation to Mr. Morris Tepper of the Bureau for advice, and assistance i delimiting the subject area of this bibliography.

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10B–1 551.509.32:551.515.3

§Farthing, E. D., **Note on tornadoes and their forecasting.** *Trans World Airlines, Inc., Kansas City, Mo., Meteorological Technical Bulletin*, No. 50-3, April 14, **1950.** 5 p. Also: his **Application of the tornado forecasting procedures outlined in 50-3.** *Ibid.*, No. 50-4, Aug. 14, **1950.** 5 p. 6 figs. Also: Trans World Airlines, Inc., K. C., Mo., **Theory of tornado formation.** *Ibid.*, No. 50-5, Nov. 13, **1950.** 3 p. 2 figs., 9 refs. **DWB**—Summary of climatic knowledge of tornadoes, rules for forecasting from upper air lapse rate of moisture data, etc., and examples of application of these rules or procedures. Showalter Stability Index, jet stream, thickness of layer where wet bulb lapse rate exceeds any adiabatic lapse rate, lifting level of free convection and other indications are used. (*Same item as* 8C–12, March 1957, *MAB.*) *Subject Headings:* **1. Tornado forecasting 2. Showalter's Stability Index.**—*M.R.*

10B–2 551.515.3(437)

Fikar, Jan, **Větrná smršť dne 20. dubna 1950.** [The tornado of April 20, 1950.] *Meteorologické Zprávy*, 4(3/4):80–82, **1950.** 8 figs., 2 plates. **DWB**—Photographs showing damage to several houses and schematic diagrams showing appearance of funnel cloud at 5 different stages are included along with a detailed description of circumstances of and damage from tornado that hit several towns in Czechoslovakia between the Moldau and Elbe rivers (north of Prague). Chart shows path and places where damage occurred (Bohnice, Sedlec, Kojetic, Bast, etc.). Personal accounts of many observers are included. (*Same item as* 3.1–99, Jan. 1952, *MAB.*) *Subject Headings:* **1. Tornadoes 2. Tornado damage 3. Czechoslovakia.**—*M.R.*

10B–3 551.515.3(773)

§Fulks, J. R. and Smith, Clarence D., Jr., **A December storm accompanied by tornadoes.** *Monthly Weather Review*, 78(12):220–225, Dec. **1950.** 10 figs., table, 4 refs. **DWB**—Tornadoes have occurred in Dec. on only 3 days since 1835 in Illinois (1876, 1949 and 1950). Three occurred on Dec. 2, 1950, during a situation attended by warm maritime tropical air at the surface and over-running maritime pacific air aloft. The surface cold front arrived half an hour or more after the tornado, in each case. The preceding and attending synoptic history is clearly illustrated and ambient wind and radiosonde data given in charts and cross sections for the day of the tornado. The upper squall line was absent in this case. (*Same item as* 2.7–89, July 1951, *MAB.*) *Subject Headings:* **1. Tornadoes 2. Synoptic-aerological studies 3. Illinois.**—*M.R.*

10B–4 551.515.3:016

†Kramer, Harris P., **Selective annotated bibliography on tornadoes.** *Meteorological Abstracts and Bibliography*, Boston, 2(5):307–332, May **1950.** 298 refs. **DLC**—The first section of the bibliography consists of 139 annotated references to analytical, theoretical and statistical studies on tornadoes, whirlwinds and water spouts arranged chronologically (imprints from 1841–1950). The second section contains references to occurrences of tornadoes, chiefly in the U. S. (1837–1950), and is not annotated. Subject and geographic outlines are provided. (*Same item as* 6B–81, Feb. 1955, *MAB.*) *Subject Heading:* **1. Tornado bibliographies.**—*M.L.R.*

10B–5 551.515.3(42)

Lamb, H. H., **Tornadoes of May 21, 1950.** *Meteorological Magazine*, London, 79(939):245–256, Sept. **1950.** 7 figs., 5 photos, table, 9 refs. Also: **Tornadoes in England, May 21, 1950.** *Great Britain. Meteorological Office, Geophysical Memoirs*, No. 99, **1957.** 38 p. 16 figs., 5 photos, 2 tables, 19 refs. **DWB**—(For accounts in **Weather,** *see* 9–65, Sept. 1950, *MAB.*) Detailed descriptions, with reproductions of autographic records, synoptic material, etc., of tornadoes (three well-developed and several incipient ones) which occurred over a wide area of East England, travelling N.E. The upper air records show great instability and vertical currents at low levels in unstable moist African tropical air in a frontogenetic situation. Tornado statistics for England are included. (For more detailed abstracts, *see* 2.2–76, Feb. 1951, *MAB* [for *Meteorological Magazine* article] and 9.1–195, Jan. 1958, *MAB* [for *Geophysical Memoirs* paper].) *Subject Headings:* **1. Tornadoes 2. Tornado distribution 3. England.**—*G.T.*

10B–6 551.515.3:551.513:551.541

Tepper, Morris, **On the origin of tornadoes.** *American Meteorological Society, Bulletin*, 31(9):311–314, Nov. **1950.** 3 figs., 6 refs. **DWB**—The hypothesis that the preferred region of tornado formation is found at the interaction zone of two intersecting pressure jumps is shown to conform to observations about the nature of tornadoes made by other investigators. This hypothesis is tested against ten tornado situations. Five verified the hypothesis very closely; in three verification was impossible because of inadequate data; in two the hypothesis was not applicable. The method

f verification and two verified situations are presented. A mechanism for the formation of a ressure jump line that is not related to a cold front is proposed, and it is regarded as associable ith an increase in wind speeds below the warm sector inversion. The pattern of this mechanism similar to the formation of a hydraulic jump by shooting water in a channel. Changes in meteoro-gical practices are suggested in order to attain data on sharp pressure discontinuities. (*Same item* s 2.3–75, March 1951, *MAB.*) *Subject Headings:* **1. Tornado formation 2. Pressure jump 3. At-nospheric circulation 4. Thermodynamics of the atmosphere.**—*I.L.D.*

10B–7 551.515.3

Tepper, Morris, **A proposed mechanism of squall lines: the pressure jump line.** *Journal of Meteorology*, 7(1):21–29, Feb. **1950.** 15 figs., table, 16 refs. Also: [**Criticism**] by Abdullah, Abdul J. nd [**Reply**] by Tepper, *Ibid.*, 10(4):298–300, Aug. **1953.** fig., 3 refs. **DWB, DLC**—A squall line May 16, 1948) was studied by means of an analysis of pressure traces and other meteorological ecords made in the micrometeorological network near Wilmington, Ohio. One-minute synoptic naps are presented to show the nature of the waves of pressure and changes in wind field. The heory is developed that the pressure jump is caused by accelerations set up by the cold front and ropagated as a wave on the inversion at a speed more rapid than that of the squall. Behind the ump comes a rarefaction wave at an even more rapid speed, and this mechanism eventually destroys ie jump wave. It is suggested that tornadoes form where two jump lines interact. (*Same item as* –48, July 1950, *MAB.*) *Subject Headings:* **1. Line squalls 2. Pressure jump 3. Tornadoes.**—*M.R.*

10B–8 551.515.3:551.501.81

Tepper, Morris, **Radar and synoptic analysis of a tornado situation.** *Monthly Weather Review*, 8(9):170–176, Sept. **1950.** 7 figs., 2 tables, 4 refs. **DWB**—The analysis of precipitation echoes ndicated by radar picture of the tornado of Nov. 14, 1949 at Pierson, Fla., and of the synoptic data or the southeastern United States, associated with it, supports the hypothesis that the interaction one of two intersecting pressure jump lines is a preferred region for the formation of tornadoes. The mechanism of a "backward" moving pressure jump line is suggested as the cause of the pressure ump line. However, microbarograph data did not verify satisfactorily the tornado hypothesis. *Same item as* 2.9–90, Sept. 1951, *MAB.*) *Subject Headings:* **1. Tornado formation 2. Radar storm etection.**—*I.L.D.*

1951

10B–9 551.515.31

§Bleeker, Wouter and Delver, A., **Some new ideas on the formation of windspouts and tornadoes.** *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, 4:220–237, **1951.** 8 figs., 17 refs. erman and French summaries p. 220–221. **DWB**—The essential problem is the central up-current, hich may be due to differential surface heating, as in dust devils, fire tornadoes and weak spouts, ut violent CuNb spouts are attributed to cooling of the neighboring air by precipitation. Previous heories are discussed, then the precipitation theory is supported by reference to 295 spouts. The iolent occurrence in Holland on Aug. 23, 1950 is examined in detail with synoptic charts. Through-ut its existence the main spout was more or less surrounded by precipitation. (*Same item as* 3–124, March 1952, *MAB.*) *Subject Heading:* **1. Whirlwinds.**—*C.E.P.B.*

10B–10 551.515.3

Brooks, Edward M., **Tornadoes and related phenomena.** (In: **Compendium of Meteorology,** oston, American Meteorological Society, **1951.** p. 673–680. 25 refs.) **DWB**—A general article ummarizing (mostly for the United States) frequency, association with intense cyclones, preliminary gns and associated weather, structure (greatest observed pressure fall 200 mb, estimated winds up 300 mph). Discusses physics of pendant cloud and dust column, tracks (90% from between S. nd W.) and speed. Theories of generation and maintenance are considered, no final conclusion ossible. Fatalities, damage and protection summarized. Dust devils and waterspouts are briefly ealt with. (*Same item as* 3.6–90, June 1952, *MAB.*) *Subject Heading:* **1. Tornadoes.**—*C.E.P.B.*

10B–11 551.571:551.511:551.515.3(76/79)

Carstensen, Louis P., **Relation of large-scale northward flow of moisture to tornado occurrence.** pril **1951.** 1 p. 3 graphs. Photostat of typescript. **DWB**—Correlograms for surface pressure fference and dewpoint in relation to tornado occurrence 12–24 hours later are presented on the asis of data for 1940–50. The area covered comprises 20 mid-western states of the U. S. The arts appear to indicate that tornado development is favored by an intense large-scale northward ow of moisture. (*Same item as* 4.10–184, Oct. 1953, *MAB.*) *Subject Headings:* **1. Tornado-oisture correlations 2. Moisture transport 3. Mississippi Valley.**—*G.T.*

10B–12 551.515.3(492)

§Delver, A., **De windhozen van 23 Augustus 1950.** [The tornado of Aug. 1950.] *Hemel en Dampkring*, 49(9):148–157, **1951.** 10 figs. **DLC**—The tornado developed under a Cu cloud associated with a cold front. At De Bilt between 17 h 12 m and 17 h 23 m about 25 mm of rain fell. At 17.14 wind reached a maximum of 20 m/sec. Barograms showed a fall followed by a short sharp rise. The structure of the "microfront" is analyzed with diagrams. Photos show destruction of trees. Distribution of rain shown half-hourly 18–20 h. (*Same item as* 3.3–122, March 1952, *MAB.*) *Subject Headings:* **1. Tornadoes 2. Netherlands.**—*C.E.P.B.*

10B–13 551.509.31:551.515.33

§Fawbush, E. J.; Miller, R. C. and Starrett, L. G., **An empirical method of forecasting tornado development.** *American Meteorological Society, Bulletin*, 32(1):1–9, Jan. **1951.** 6 figs., table, 12 refs. **DWB**—Charts show frequency of tornadoes in eastern U. S. by months and for year (1920–1949). Relation to elevation and air mass or frontal characteristics, formulated. Situation on May 5, 1950 analyzed in detail. Success of forecasting method outlined herein, shown by verification figures for 1949–1950 seasons. (*Same item as* 2.9–41, Sept. 1951, *MAB.*) *Subject Headings:* **1. Tornado forecasting 2. Tornado distribution 3. Mississippi Basin.**—*M.R.*

10B–14 551.515.8:551.515.3(52)

§Fujita, T., **Micro-analytical study of cold front.** *Geophysical Magazine*, Tokyo, 22(3):237–277, Feb. **1951.** 40 figs., 6 refs. **DWB**—A most elaborate and detailed study of a cold front situation which resulted in a tornado at Enours in Fukuoka Prefecture, Japan, and one at Oura near Matsuyama, on Sept. 26, 1948. Surface and upper level synoptic charts for the Far East, cross sections, "four dimensional" charts showing precipitation or pressure vs. area and time, automatic records, schematic diagrams showing distribution of elements in the system, time cross-sections of wind, temperature and humidity up to 3 km, isopleths of pressure, temperature and precipitation for every 20 min during the day of Sept. 26, 1948, are presented and discussed. Two special features are treated: (1) heavy rain cells occurring prior to the warm front, and (2) cold front accompanied by no appreciable rain. The multiple structure of the cold front is nicely illustrated. Finally the absorption of the cold air into the primary cyclone is discussed. (*Same item as* 3.9–114, Sept. 1952, *MAB.*) *Subject Headings:* **1. Synoptic aerological studies 2. Cold fronts 3. Tornadoes 4. Japan.**—*M.R.*

10B–15 551.509.3:551.515.3

Gordon, A. H., **Waterspouts, Part I.** *Marine Observer*, 21(151):47–60, Jan. **1951.** 5 figs. 4 photos, 2 tables, 6 refs. **Pt. II.** *Ibid.*, 21(152):87–93, April **1951.** 2 figs. **DWB**—After a reference to damage by waterspouts, the dynamics and convection theories of their formation, the mechanics of rotation, and structure are described. Temperature and vapor pressure gradients in lowest 200 cm are shown for sea warmer than air and vice versa. An investigation carried out from punch cards is described and a world map of the frequency distribution per 10,000 ships' observations presented. This shows maxima exceeding 20 or 30 in doldrums, on western side of subtropical anticyclones and in central Mediterranean. A zonal table shows maxima in 0–10° and 30–40°N. and S. lat., where instability is most frequent. An analysis is also made of frequencies with different meteorological conditions, and diurnal and annual variations (maximum daytime, Oct. in Northern and April in Southern Hemisphere, secondary maximum in spring). Most favorable condition—superadiabatic lapse rate in lowest 500 mb. Nine assisting factors are listed. Forecasting waterspouts briefly discussed. The photographs are of great interest. (*Same item as* 2.7–90, July 1951 and 2.11–83, Nov. 1951, *MAB.*) (For condensed version of this paper in *Weather*, *see* 3.10–127, Oct. 1952, *MAB.*) *Subject Headings:* **1. Waterspouts 2. Waterspout forecasting 3. Punched card methods.**—*C.E.P.B.*

10B–16 551.515.33:551.501.83

Jones, Herbert L., **A sferic method of tornado identification and tracking.** *American Meteorological Society, Bulletin*, 32(10):380–385, Dec. **1951.** 5 figs. Also: Jones, Herbert L. and Hess, Philip N., **Identification of tornadoes by observation of waveform atmospherics.** *Institute of Radio Engineers, Proceedings*, 40(9):1049–1052, Sept. **1952.** 9 figs. **DLC**—Research on sferics from tornadoes, conducted since 1947 at Oklahoma Agricultural and Mechanical College, is reported. Apparatus consisting of detecting and amplifying elements and automatic photorecording device is described and shown in circuit diagrams. Results for the seasons 1950 and 1951 are discussed and records of thunderstorm and tornado sferics reproduced. High frequency components were observed to appear during tornado activity only and to be nonexistent during regular thunderstorms. The number of such discharges in the 200 to 400 kc band was found to increase as the tornado stage is approached. (*Same items as* 3.7–110, July 1952 and 4.4–34, April 1953, *MAB.*) *Subject Heading* **1. Sferics tornado detection.**—*G.T.*

10B–17 551.515.31

Koschmieder, Harald, **Zur Trombenbildung.** [On tornado formation.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, 4:203–219, **1951.** 9 figs., 24 refs. English and French summaries p. 203–204. **DWB**—Dust devils and tornadoes are roughly classified as due to eddying warm air over lava and volcanoes, disturbances of field of flow by buildings, squall cloud tornadoes and American tornadoes (integration of whirls by earth's rotation). Greatest pressure deficit about 50 mb in Europe but exceeds 100 mb in America. The causes of this deficit are probably dynamic, due to inertia of rotating air. An appendix on two dust whirls at Bremen June 17, 1950, gives hints on evaluation of photos. (*Same item as* 3.3–126, March 1952, *MAB.*) *Subject Headings:* **1. Dust devils 2. Tornadoes 3. Whirlwinds.**—*C.E.P.B.*

10B–18 551.515.31:551.511.3

*Rossmann, Fritz (*Met. Inst. Univ. of Munich*), **On the tornadoes.** [1951?] 9 p. 7 figs., 7 refs., eqs. Manuscript. **DWB**—Differential equations are presented for 3 cases of possible wind movement in tornadoes, and the conclusion is drawn that air is descending powerfully, with only slight rotational motion, inside a tornado, but admittedly is rising immediately outside this descending jet. The evidence cited is from literature dating back to 1841, but especially the work of WEGENER (1917) and MÜGGE (1927) who advanced a similar theory. Photographs of tornadoes, schematic diagrams, and nomograms based on the differential formulas are presented in this manuscript treatise. (*Same item as* 4.8–107, Aug. 1953, *MAB.*) *Subject Headings:* **1. Tornado dynamics 2. Waterspouts.**—*M.R.*

10B–19 551.515.31(43,44)

Rossmann, Fritz, **The tornadoes as a meteorological process.** [1951?] 9 p. 7 figs., 7 refs. Manuscript. **DWB**—With numerous references to early literature regarding tornadoes and waterspouts, the author argues the case for downward motion in such storms, insisting that the depression of the water surface under a waterspout cannot be due to the rotational motion (as the whirl does not stay long enough in one spot to transfer its energy to the water) but to the depressing effect of the powerful jet which is directed downward from the cloud. The differential equation used by the author with respect to dynamics of föhn winds, is extended to cover the case of the tornado. Charts show distribution of tornadoes in Germany and France. (*Same item as* 4.8–108, Aug. 1953, *MAB.*) *Subject Headings:* **1. Tornado dynamics 2. Waterspouts 3. Tornado distribution 4. Germany 5. France.**—*M.R.*

10B–20 551.515.31:551.511.3

Rossmann, Fritz, **Über Wolkentromben.** [On cloud spouts.] *Annalen der Meteorologie*, (1–6):48–55, **1951.** 7 figs., 17 refs. **DWB**—The question whether air rises or descends in the core of a tornado is discussed, and the shape of the core in a vertical wind gradient determined for each case. Comparison with photos of tornadoes shows that the air is descending in the core. Over a water surface the divergent rising air at the base throws up a girdle of spray. (*Same item as* 3.3–127, March 1952, *MAB.*) *Subject Heading:* **1. Tornado dynamics.**—*C.E.P.B.*

10B–21 551.515.3

Tepper, Morris, **The Tornado and Severe Storm Project.** *Weatherwise*, 4(3):51–53, June **1951.** figs. **DWB**—The stations utilized are shown on a map. The basic instrument is a modified Friez microbarograph. Data for testing the pressure jump hypothesis for the origin of tornadoes will be gathered. (*Same item as* 3.3–123, March 1952, *MAB.*) *Subject Headings:* **1. Tornado and Severe Storm Project 2. Tornado research. U. S. Weather Bureau.**—*I.L.D.*

1952

10B–22 551.509.5:551.515.3

§Carr, J. A., **A preliminary report on the tornadoes of March 21–22, 1952.** *Monthly Weather Review*, 80(3):50–58, March **1952.** 22 figs., refs. **DWB**—Surface synoptic chart shows relation of areas of thunderstorm, tornadoes and precipitation to air masses and fronts. Composite charts show 3-hourly frontal movements March 19–22, 1952. Upper and adiabatic level charts show vertical structure on March 21 and 22 in vicinity of tornadoes. Instability charts (potential and Showalter types), show correspondence of high instability with areas of tornado occurrence. A barograph trace for Dyersberg, Tenn., illustrates drop in pressure when tornado passed 41 yds from station. (*Same item as* 4.2–65, Feb. 1953, *MAB.*) *Subject Headings:* **1. Tornado forecasting 2. Mississippi Basin.**—*M.R.*

10B–23 551.515.327

Fawbush, W. J. and Miller, R. C. (*Tinker Air Force Base, Okla.*), **A mean sounding representative of the tornadic airmass environment.** *American Meteorological Society, Bulletin*, 33(7):303–307,

Sept. 1952. 8 figs., table, 2 refs. **DWB**—A mean tornado sounding was constructed on the basis of more than 72 soundings of the air mass considered representative of tornadic air. Data on the mean and extreme moist-layer depth, inversion base, inversion top, zero isotherm and lifting level of free convection for the mean sounding and on the relative humidity of the air mass at various levels are given in a table. The mean sounding is similar to the prerequisite air mass structure for tornadoes determined by SHOWALTER. The typical tornado air mass was found to show a great seasonal variation. Individual cases of typical soundings are analyzed with the aid of diagrams. (*Same item as* 4.8–111, Aug. 1953, *MAB.*) *Subject Heading:* **1. Tornado dynamics.**—*I.L.D.*

10B–24 551.515.3:551.556.1(43)

Klauser, Leopold, **Die Trombenerscheinungen bei Potsdam am 26.6.1951.** [Tornadoes near Potsdam on June 26, 1951.] *Zeitschrift für Meteorologie*, 6(5):151–155, May **1952.** fig., 3 refs. **DWB**—A detailed description of the tornado which was accompanied by water spouts and the damage it caused is presented. The general weather situation that preceded and during the appearance of the tornado and the attendant aerological conditions, barometric pressure and wind velocity and direction, are described in detail. (*Same item as* 4.1–108, Jan. 1953, *MAB.*) *Subject Headings:* **1. Tornadoes 2. Tornado damage 3. Waterspouts 4. Potsdam, Germany.**—*I.L.D.*

10B–25 551.509.5:551.515.3:551.511.32(781/2)

Shuman, F. G. and Carstensen, L. P. (*U. S. Weather Bur., Wash., D. C.*), **A preliminary tornado forecasting system for Kansas and Nebraska.** *Monthly Weather Review*, 80(12):233–240, Dec. **1952.** 11 figs., 3 refs., 8 eqs. **DWB**—Attempt to establish an objective forecasting system of tornadoes for 12 hours in advance, based on weather situations at 1500 GMT, analyzed for 1 selected months. Group selected with 60% tornado probability which includes 30% of all reported tornadoes. Necessary conditions for the occurrence of tornadoes are a strong contrast in temperature advection across a pressure trough (700 mb) above the area, when a deep cold air mass lies westwards and maritime tropical air over or southeast of the area. Quantitative characteristics for these conditions selected. Formulas for computing temperature advection by triangulation developed. (*Same item as* 4.8–61, Aug. 1953, *MAB.*) *Subject Headings:* **1. Tornado forecasting 2. Objective tornado forecasting 3. Advection 4. Kansas 5. Nebraska.**—*A.A.*

10B–26 551.515.3:551.509.5:551.556.1(76)

Spring tornadoes and the tornado warning service. *Weatherwise*, 5(2):31, April **1952. DWB**—Brief description of the havoc caused by the tornado which struck the Mississippi Valley on March 21, 1952. The Weather Bureau Tornado Warning Service issued tornado warnings as a very active storm center began to move on a north-northeast track towards the Great Lakes. "Exceptionally cold air for the season lay to the west" at the same time that a "very warm moist air mass occupied the Gulf States." "The tornadoes as predicted occurred in the area just to the east of the cold front." (*Same item as* 4.1–109, Jan. 1953, *MAB.*) *Subject Headings:* **1. Tornado damage 2. Tornado forecasting 3. Tornado tracks 4. Mississippi Valley. I. U. S. Weather Bureau Tornado Warning Service.**—*I.L.D.*

10B–27 551.515.3(76)

Tornado funnel observed at 35,000 feet. *American Meteorological Society, Bulletin*, 3(8):350–351, Oct. **1952.** fig. **DWB**—A sketch and description "of a tornado which projected from the base of a cumulo-nimbus overhang reaching 35,000 feet and extended downward to the ground where the violently whirling tube merged into the usual heavy dust-cloud associated with a full fledged tornado." It was "observed from an airplane flying at 20,000 feet southwest bound between Harrison and Fort Smith, Arkansas at 1630 CST on April 3, 1950." (*Same item as* 4.8–109, Aug. 1953, *MAB.*) *Subject Headings:* **1. Tornado observation 2. Arkansas.**—*I.L.D.*

10B–28 551.515.3:551.515.

United Air Lines, Inc., **Notes on certain tornado and squall line features.** *United Air Lines Meteorology Circular*, No. 36, April 15, **1952.** 13+p. 10 figs. **DWB**—A review of pressure gradients and wind conditions associated with tornadoes and squall lines with particular reference to instances in which tornadoes passed very close to barographs is presented. Barograph traces show a marked pressure gradient adjacent to but definitely outside the funnel itself. The bases of tornadoes are usually elevated 50–100 ft above the surface. The barograph nose is a useful synoptic element. Lightning might be a very practical means of detecting the presence of a tornado in a thunderstorm. (*Same item as* 5.2–119, Feb. 1954, *MAB.*) *Subject Headings:* **1. Tornadoes 2. Squall lines 3. Pressure gradient.**—*I.L.D.*

10B–29 551.515.3(73):551.556.1

*U. S. Weather Bureau. **Tornado occurrences in the United States.** Prepared by Climatological Service Division. *U. S. Weather Bureau, Technical Paper*, No. 20, Sept. **1952.** Price: $0.35. 43 p. 14 figs., 13 charts, 5 tables, 7 refs. **DWB**—Data for some outstanding tornadoes are given for the period 1875–1950. The worst tornado occurred in March 1925, when a total of 689 lives was lost within three hours and about 2000 persons were injured. Property damage during a single tornado up to $22,000,000. More detailed information on number of tornadoes, tornado days, death and damage given since 1916 (arranged by states). Average annual number of tornadoes for United States 149 on 66 days with 227 deaths and property damage 13.6 million dollars. Current monthly data (1916–1950) given for the whole United States, mean monthly data also for each state (maximum in May). Another table summarizes the diurnal variation (maximum 4–6 p.m., minimum 6–8 a.m.). Numerous graphs characterize seasonal and diurnal variation, as well as total for each day of the year. Monthly and annual charts show location and tracks of tornadoes. (*Same item as* 4.8–110, Aug. 1953, *MAB.*) *Subject Headings:* **1. Tornado statistics, U. S. (1916–1950) 2. Tornado damage 3. Singularities 4. United States.**—*A.A.*

1953

10B–30 551.509.5:551.515.3(758)

Armstrong, Harry (*U. S. W. B. Airport Station, Atlanta, Ga.*), **Forecasting tornadoes in Georgia.** *Monthly Weather Review*, 81(9):290–298, Sept. **1953.** 10 figs., 13 refs. **DWB**—Some climatological data on the seasonal, diurnal and geographical distribution of tornadoes in Georgia are presented, and the tornado "season" is defined as occurring from Feb. through April. Twelve different storms producing tornadoes during one or more 12-hr forecast periods are studied for synoptic similarities. A mean tornado sounding and a 700 mb composite chart, taken from data preceding tornado occurrences, are shown. Large differences are found in surface map types whereas at the 700 mb level there are striking similarities. The synoptic similarities are incorporated into an objective forecast aid through a stratification process such that most "no-tornado" cases are quickly dismissed by an inspection of the maps currently available in forecast offices, whereas "threat" cases must be further checked against the criteria and four scatter diagrams. Tests show that this aid, when used as a method in itself, correctly anticipates most of these storms and at the same time, it results in about $2\frac{1}{2}$ forecasts of tornadoes for every one reported. (*Same item as* 8C–4, March 1957, *MAB.*) *Subject Headings:* **1. Tornado distribution 2. Tornado forecasting 3. Synoptic conditions for tornadoes 4. Georgia.**—*Author's abstract.*

10B–31 551.515.3(744):551.556.1

Booker, Clyde A., **Tower damage provides key to Worcester tornado data.** *Electrical World*, N. Y., 140(7):22–24, Aug. 17, **1953.** diagrs., illus. Also his: **On transmission towers destroyed by the Worcester, Mass., tornado of June 9, 1953.** *American Meteorological Society, Bulletin*, 35(5):225, 229, May **1954.** 2 figs. **DWB**—The probable minimum and maximum wind velocities of the June 9, 1953 tornado in Worcester, Mass., are estimated from the strength values of transmission towers established previously by factory test. Average velocities of 148 and 170 mph and a maximum peripheral velocity of 343 mph were estimated. (*Same item as* 5.4–105, April 1954 and 6.8–264, Aug. 1955, *MAB.*) *Subject Headings:* **1. Tornado wind velocities 2. Wind load on structures 3. Tornado damage 4. Tornado, Worcester, Mass. (June 1953) 5. Worcester, Mass.**—*I.L.D.*

10B–32 551.515.8:551.515.3(73)

§Brunk, Ivan W., **Squall lines.** *American Meteorological Society, Bulletin*, 34(1):1–9, Jan. **1953.** 13 figs., 17 refs. **DWB**—Author shows how to identify squall lines on synoptic charts by the surface windshifts, where usually an area of severe turbulence is located. Characteristic samples are shown for the hourly movement of the squall. The diurnal frequency of the squall lines is computed (maximum afternoon), as well as the frequency of severe turbulence at different levels (maximum between 2000 and 3000 ft in squall line cases, at higher levels in frontal cases). The connection between squall lines and tornadoes, flying conditions in squall lines and forecasting problems are discussed. Squall lines move most frequently under an angle of 45° clockwise from the wind direction at 700-mb. (*Same item as* 5.9–144, Sept. 1954, *MAB.*) *Subject Headings:* **1. Squall lines 2. Tornadoes 3. Atmospheric turbulence 4. United States.**—*A.A.*

10B–33 551.515.31:551.513

Carey, Frank (*Associated Press*), **Vast wind stream in upper air blamed for year's tornadoes.** *Evening Star*, Washington, D. C., A-4, June 11, **1953.** illus. **DLC**—The planetary wave train whose central core is the jet stream is suggested as the cause of unusual tornado activity in 1953. A horizontal trough in the planetary wave is said to have developed, pulling cold air down from the

Arctic region and thus causing tornado activity. A map showing the positions of the planetary jet wave and of storm tracks over the U. S. is presented. The author's information is based mainly on statements of J. NAMIAS, Chief of Long Range Forecasting Div., U. S. Weather Bureau. (*Same item as* 5.2-120, Feb. 1954, *MAB.*) *Subject Headings:* **1. Planetary circulation 2. Tornado formation 3. Tornado tracks.**—*G.T.*

10B-34 551.509.5:551.515.3

Fawbush, Ernest J. and Miller, Robert C. (*Tinker Air Force Base, Okla.*), **Forecasting tornadoes.** *Air University Quarterly Review*, 6(1):108–117, Spring **1953.** 12 figs.—The seasonal frequency of tornadoes in the eastern U. S. is shown on 6 charts and the annual frequency on a 7th. Conditions required to generate tornadoes, features of a mean tornado sounding based on 75 cases, and detailed procedures for the analyst to use in determining potential instability; examples of surface, isotach, 700 mb and 500/800 mb combined charts; example of a composite chart showing maximum potential instability (using Showalter's Stability Index, etc.) and, finally, 5 conditions which are considered necessary for destructive thunderstorm occurrences are presented. (*Same item as* 5.5–66, May 1954, *MAB.*) *Subject Headings:* **1. Tornado forecasting 2. Storm warnings 3. Showalter's Stability Index 4. Tornado frequencies 5. Eastern United States.**—*M.R.*

10B-35 551.509.5:551.515.3(767)

Fawbush, Ernest J. and Miller, Robert C., **The tornado situation of 17 March 1951.** *American Meteorological Society, Bulletin*, 34(4):139–145, April **1953.** 11 figs., 4 refs. **DWB**—Conditions which the authors consider important (if not necessary) for tornado development are enumerated. These are: 1) deep layer of dry air (<50% R.H.) aloft; 2) a low layer of moist air with a high mixing ratio compared to the dry layer above; 3) a wind maximum between 10 and 20 thousand feet (>35 knots) and making a large angle with the axis or edge of the moist tongue (most severe storms occur 50 to 150 miles S of this core); 4) a low level of free convection, and 5) a strong impulse such as a cold front or prefrontal line squall to initiate the storm. The conditions which prevailed early March 17, 1951 in Texas-Oklahoma and Lower Mississippi Valley, in all of the above respects, are described and illustrated by charts and diagrams, and verification shown on chart. (*Same item as* 5.5–67, May 1954, *MAB.*) *Subject Headings:* **1. Tornado forecasting 2. Tornado formation 3. Synoptic conditions for tornadoes 4. Arkansas.**—*M.R.*

10B-36 551.501.81:551.515.3(764)

Freeman, John C., Jr. (*Dept. of Oceanog., Texas A. & M. College*), **Radar echoes in tornado situations.** (In: Conference on Radio Meteorology, Univ. of Texas, Austin, Nov. 9–12, 1953, **Proceedings,** [v. 1]: X-5, pub. **1953.** 6 p. 4 figs., 2 refs.) **DLC, DWB**—Three tornado situations in the spring of 1953 within 120 mi of Austin, Texas, were observed on radarscopes. Two of them were photographed, and in the other case drawings were made of echoes which could be associated with the tornado areas. "Appendages" which occurred on the scope in the vicinity and at the time of the Waco tornado (May 11) are clearly indicated. Intense echoes associated with other storms did not show these "appendages." Also occurrence of appendages does not indicate that a tornado reaches the ground. A brief explanation or theory of tornado formation in terms of vortex sheets is included and the model reproduced schematically. (*Same item as* 6G–123, July 1955, *MAB.*) *Subject Headings:* **1. Radar tornado detection 2. Tornado appendages 3. Tornadoes, Texas (1953) 4. Texas.**—*M.R.*

10B-37 551.509.52:551.515.3:551.501.81

Kahan, Archie M. (*Texas A. & M. College*), **The first Texas tornado warning conference.** (In: Conference on Radio Meteorology, Univ. of Texas, Austin, Nov. 9–12, 1953, **Proceedings,** [v. 1]: X-6, pub. **1953.** 4 p.) **DLC, DWB**—The conference was conceived at the time of the Waco tornado on May 11, 1953, and was organized rapidly with full cooperation from all agencies and the help of CAPT. H. T. ORVILLE. The first conference was held on June 24, 1953. The working committee on implementation of the recommendations of the conference met on July 9, 1953 at Waco, Texas and again at Fort Worth on Aug. 20, 1953. The Weather Bureau agreed to furnish any of 100 APS-2 radar sets they were modifying for use as weather radar to any community that would convert them at their own expense. Further implementation took the form of installation of a direct tie line phone from Dept. of Public Safety at Austin and U. S. W. B., and agreement that U. S. W. B. officials could notify local Safety Dept. captains whenever a tornado was imminent. (*Same item as* 6G–131, July 1955, *MAB.*) *Subject Headings:* **1. Texas tornado warning network 2. Radar tornado warning networks 3. Tornado warning networks 4. Texas.**—*M.R.*

10B-38 551.515.31(771)

Lewis, William and Perkins, Porter J. (*both, NACA, Cleveland, Ohio*), **Recorded pressure distribution in the outer portion of a tornado vortex.** *Monthly Weather Review*, 81(12):379–385, Dec.

953. 6 figs., 3 tables, 6 refs. **DWB**—Records were obtained on 9 barographs within a short istance of the path of a tornado which passed through the Lewis Flight Propulsion Lab. of the NACA at Cleveland Airport. Details of the storm and the traces made at distances of 720 to 3200 t from the tornado path are given. A model consisting of winds following a spiral (inward) path a sink and a vortex) is used to extrapolate pressure and wind data to the center or region of maximum vinds. A tornado low was evident from the nearby barograph traces. Winds outside the vortex vere higher on the right hand than the left hand side. Radius of core was 200 to 700 ft. *Subject Headings:* **1. Tornado models 2. Barograph traces near tornado 3. Tornado vortex observations . Tornado, Cleveland (June 8, 1953) 5. Cleveland, Ohio.**—*M.R.*

10B–39 551.515.3:551.515.2(755)

Malkin, W. and Galway, J. G. (*U. S. W. B., WBAN Analysis Center, Wash., D. C.*), **Tornadoes ssociated with hurricanes. As illustrated by Franconia, Va., tornado, Sept. 1, 1952.** *Monthly Veather Review,* 81(9):299–303, Sept. **1953.** 6 figs., tables, 17 refs. **DWB**—One of the tornadoes ssociated with hurricane "Able," 1952, occurred near Wash., D. C., and simultaneously with the pper air sounding made there. This led to a comparison between this particular tornado, along vith others of similar environment, and conditions attributed to tornadoes in general. All such ornadoes associated with hurricanes have to date been observed only in the forward semicircle r along the advancing periphery of the tropical storm. The evidence is strong in favor of time of lay having little relation to the occurrence of such tornadoes. A hypothesis is suggested wherein he weaker or nonexistent cyclonic horizontal wind shear of the environment may contribute to the esser severity of these tornadoes. Unlike the typical tornado sounding, the limited evidence ndicates the absence of (1) a low level temperature inversion, (2) sharp moisture stratification of lry air over moist air, (3) excessive instability. (*Same item as* 5.7 91, July 1954, *MAB.*) *Subject Headings:* **1. Tornadoes associated with hurricanes 2. Hurricane "Able" (1952) 3. Tornadoes . Franconia, Va.**—*Authors' abstract.*

10B–40 551.509.61:551.515.3

Mayer, Rollins H. (*A. F. Missile Test Center, Patrick AFB, Fla.*), **A proposal for research on the possibility of the destruction of tornadoes with missiles guided by weather radar.** (In: Conference on Radio Meteorology, Univ. of Texas, Austin, Nov. 9–12, 1953, **Proceedings,** [v. 1]: X-8, pub. **1953.** 4 p. 6 refs.) **DLC, DWB**—The tornado-destruction program outlined here is based on ROSSMAN'S theory that tornadoes can be dissipated and destroyed by disrupting the critical stabilized liameter at the feeding source. The objective may be accomplished by specifically designed radar ets for tornado detection, jet planes launching the guided missiles and mobile tornado stations ncorporated in the nation-wide network. (*Same item as* 6G–137, July 1955, *MAB.*) *Subject Headings:* **1. Tornado dissipation 2. Radar tornado detection.**—*W.N.*

10B–41 551.515.3:551.556.1(521.61)

§Ota, Y. and Sawairi, S., **Tornado on 2 November 1951.** *Journal of Meteorological Research,* Tokyo, 5(3):135–141, March **1953.** 6 figs. In Japanese; English summary p. 135. **DWB**—Description with weather charts, records and photographs of a tornado which occurred at 23 h on Nov. 2, 1951 along the coast of Suruga Bay, causing severe damage to houses and trees. The damage was excessive compared to the intensity of the tornado. The tornado formed by excitation by a cold front, which, in crossing the table-land, caused a gust exceeding 50 m/sec in instantaneous wind velocity. This was the main cause of the extensive damage. (*Same item as* 8.1–215, Jan. 1957, *MAB.*) *Subject Headings:* **1. Tornado damage 2. Honshu, Japan.**—*Authors' abstract.*

10B–42 551.501.83:551.515.3(766)

Pick, Lawrence A., **Characteristics of sferics associated with tornadoes.** (In: WMO. Commission for Aerology, Working Group on Radio-Electric Meteorology, Zurich, March 17–24, 1953, **Colloque Mondial de Parasites Atmosphériques, Acte Final, 1953.** Document de Travail, No. 31. 3 p.) **DWB**—Sferics associated with thunderstorms are classified into 4 categories according to the ratio between the number of high frequency wave forms and the number of ordinary low frequency wave forms. If the ratio is greater than 1 to 2 it is predicted that tornado or near-tornado situations will exist; as in near-tornado formations in Oklahoma a ratio of 1 to 2 was observed. The rate of occurrence of sferics is also very high in such cases, about 18 to 20 sferics per second being recorded on film at 10 Kc frequency. Improvements in recording equipment to get better data on rate of frequency are suggested. (*Same item as* 4K–288, Nov. 1953, *MAB.*) *Subject Headings:* **1. Tornado forecasting from sferics 2. Short wave sferics 3. Sferics rate 4. Stillwater, Okla.**—*M.R.*

10B–43 551.501.81:551.515.31(773)

Radar tracks an Illinois tornado. *Weatherwise*, 6(3):76–77, June **1953.** photo. **DWB**—Three remarkable radar photographs taken at 1716, 1719 and 1733 h on April 9, 1953 at the Radar Meteorology Station of the Illinois State Water Supply near Champaign, Ill., show what appears to be the tornado vortex appendage to a rapidly moving (50 mph) thunderstorm in 3 stages of its development. A destructive tornado actually was reported at the time and place shown by the series of time lapse photos from which these were selected. The echo seems to be larger on a horizontal scale than the tornado itself could have been. (*Same item as* 5.9–42, Sept. 1954, *MAB.*) *Subject Headings:* **1. Radar photographs 2. Tornado appendages 3. Tornado tracking 4. Champaign, Ill.**—*M.R.*

10B–44 551.501.81:551.501.9:551.515.3

Rockney, Vaughn D. and Jay, Lee A. (*both, U. S. W. B., Wash., D. C.*), **The radar storm detection program of the U. S. Weather Bureau.** (In: Conference on Radio Meteorology, Univ. of Texas, Austin, Nov. 9–12, 1953, *Proceedings*, [v. 1]: X-2, pub. **1953.** 7 p. fig., table.) **DLC, DWB**—A chart of the U. S. shows location of U. S. Weather Bureau stations equipped with storm detection radar. At the time article was written there were 23 stations, 9 operated by cooperative institutions. Purposes (forecasting, observations of storms and research) are outlined and plans for expanding use of radar for detection of tornadoes, hail, hurricanes, fire weather and other aspects of U. S. Weather Bureau program are discussed. (*Same item as* 6G–149, July 1955, *MAB.*) *Subject Headings:* **1. Radar storm detection networks 2. United States.**—*M.R.*

10B–45 551.509.5:551.515.3/4

Showalter, A. K., (*WBAN Analysis Center, Wash., D. C.*), **A stability index for thunderstorm forecasting.** *American Meteorological Society, Bulletin*, 34(6):250–252, June **1953.** 2 figs., 3 refs. **DWB**—The history of the Showalter Stability Index, its calculation and usefulness in forecasting thunderstorms is outlined, and it is compared with the Gardner-Scherhag Instability Index (which is calculated in the same way only with reversal of sign + or −). In both cases, the parcel of air is lifted adiabatically from 850 mb to saturation and then pseudo-adiabatically from there to 500 mb and the difference between the lifted temperature and the observed used as the index. In the Showalter Index a value of +6°C would be very stable and one of −6° or −8° would indicate probability of a violent storm or tornado. A new Index—the Showalter Tornado Index is described and its use with the Stability Index illustrated. It consists of θ at top of moist layer, $-\theta$ at wet-bulb zero level, in whole degrees (°A). Check on spring 1952 cases shows probability of tornadoes if 0° or Tornado Index coincides with area of 0° or Stability Index. (*Same item as* 6.7–148, July 1955, *MAB.*) *Subject Headings:* **1. Showalter's Stability Index 2. Showalter's Tornado Index 3. Gardner-Scherhag Instability Index 4. Tornado forecasting 5. Thunderstorm forecasting.**—*M.R.*

10B–46 551.515.3(773):551.501.81

Stout, G. E. and Huff, F. A., **Radar records Illinois tornadogenesis.** *American Meteorological Society, Bulletin*, 34(6):281–284, June **1953.** 2 figs., 2 refs. **DWB**—Radar PPI scope photographs taken during routine radar rainfall measurements on April 9, 1953 at Urbana, Ill., show a remarkable spiral cloud formation which lasted from about 1700 to 1738 local time and coincided with the passage of an actual tornado of great intensity and breadth that did $3 million damage. The 12 pictures from the APS-15 3cm radarscope show the various stages of development from 1644 to 1800 h. Meteorological conditions are described. This is the first radar photograph of a tornado vortex cloud ever published. (*Same item as* 6G–153, July 1955, *MAB.*) *Subject Headings:* **1. Tornado, Urbana, Ill. (April 1953) 2. Radar tornado photographs 3. Urbana, Ill.**—*M.R.*

10B–47 551.509.52:551.515:551.501.81

U. S. Weather Bureau, **Radar weather observations in the Texas area.** Wash., D. C., July **1953.** 4 p. 2 diagrs., 16 photos. **DWB**—The Texas radar plan is discussed and mapped. It requires at least 15 more radar sets to assist the seven radars in operation (on July 1, 1953) in Texas and Louisiana. Experience from radar storm warning shows that the destruction by hurricanes can be reduced by some 60%; in addition human lives are saved by tornado warning. Excellent radar scope photographs show cold front, thunderstorms, tornado and hurricanes. (*Same item as* 6G–163, July 1955, *MAB.*) *Subject Headings:* **1. Tornado warning network 2. Radar tornado warning networks 3. Texas.**—*W.N.*

10B–48 551.515.31

Ward, Neil B. (*W. B. Off., Oklahoma City, Okla.*), **A process for the formation and maintenance of tornadoes.** Sept. 12. **1953.** 8 p. figs., 5 refs. Carbon of typescript. **DWB**—Tornadoes form in thunderstorm cells when an inversion limits the convective activity in all but a limited area. In these limited areas the restricting of the field of flow produces increased vorticity and centrifugal force which results in release of latent heat as the air expands adiabatically as it moves horizontally

inward. Mass must be taken out at the top or the system would reach equilibrium. The release of latent heat of condensation results in the extension of the funnel cloud to the ground. The smaller the vortex the greater the increase in velocity as the vorticity is conserved. A model is presented to show the forces operating according to the above theory. (*Same item as* 5.11–95, Nov. 1954, *MAB.*) *Subject Headings:* **1. Tornado formation 2. Tornado theory.**—*M.R.*

10B–49 551.543.3:551.515.3

§Williams, D. T. (*Tornado and Severe Storm Project, W. B. Regional Office, Kansas City, Mo.*), **Pressure wave observations in the central Midwest.** *Monthly Weather Review*, 81(9):278–289, Sept. **1953.** 18 figs., 5 tables, 15 refs. **DWB**—Data from the 1952 Tornado and Severe Storm Observational Network indicate that pressure waves (abrupt variations in surface pressure) occur frequently in the central Midwest. These waves are classified and studied statistically for relationships with certain weather phenomena. Elevation type wave lines are found to coincide with certain synoptic discontinuities (squall lines, cold fronts, etc.). Thunderstorm activity accompanied 78% of these lines, and tornadoes occurred with 27%. Data on the motion of elevation type wave lines, and on the size, amplitude, and duration of their fields of activity are summarized. A marked tendency for these waves to occur during nocturnal hours is found. Depression type wave lines are found not to coincide with ordinary synoptic discontinuities. A combination type wave is described and some speculation on its significance is made. Examination of the relation of tornadoes to pressure waves shows a tendency for tornadoes to occur in specific portions of the elevation wave field. (*Same item as* 5.7–112, July 1954, *MAB.*) *Subject Headings:* **1. Pressure waves 2. Atmospheric disturbances 3. Tornado data 4. Midwestern United States.**—*Author's abstract.*

10B–50 551.515.3(73)

§Winston, Jay S., **The weather and circulation of May 1953—One of the worst tornado months on record.** *Monthly Weather Review*, 81(5):135–140, May **1953.** 5 figs., 3 refs. **DWB**—Number of tornadoes 113, the greatest ever observed for any month; 27 occurred on one day. Characteristic circulation anomalies: a trough in the west and a ridge over the east coast of U. S., causing a stronger than normal flow from the Gulf of Mexico. The distribution of precipitation for ten-day periods in May 1953 is compared with the 700 mb circulation pattern. For the same periods the number of days with surface fronts is shown. *Subject Headings:* **1. Tornado statistics 2. Tornado frequencies 3. Synoptic conditions for tornadoes 4. United States.**—*A.A.*

1954

10B–51 551.509.5:551.515.3

§Barnett, Kenneth Marshall, **A test of tornado forecasting parameters.** Wash., D. C., U. S. Weather Bureau, **1954.** 6+p. 12 figs., table, 5 refs. Mimeo. **DWB**—The Severe Local Storm Warning Center (SELS) of the U. S. Weather Bureau has assembled information on objective forecasting and selected the most effective parameters for operational use after testing their relative accuracy. The 5 conditions which indicate a tornado "threat area," and 4 additional conditions which give "major confidence" to forecast, plus a simple procedure for determining the approximate area are given. Surface dew point, the "Stability Index" and "Tornado Index" of Showalter, the depth of the "moist layer," the 700 or 500 mb winds and the level of free convection are the most significant criteria for forecasting. Gives examples of application of procedure outlined. (*Same item as* 6.11–158, Nov. 1955, *MAB.*) *Subject Headings:* **1. Tornado forecasting parameters 2. Objective tornado forecasting 3. Showalter's Stability Index. I. U. S. Weather Bureau.**—*M.R.*

10B–52 551.515.3

†Delver, A., **Hozen en hozentheorieën.** [Tornadoes and tornado theories.] *Netherlands. Meteorologisch Instituut, Verspreide Opstellen*, No. 2, **1954.** 83 p. 40 figs., 85 refs. **DWB**—This moderately technical monograph contains a description of windspouts, tornadoes, dust devils, fire tornadoes and experimental tornadoes, the meteorological and physical characteristics of tornadoes and allied phenomena based upon some 300 cases and theories of tornado formation. With the aid of numerous photographs and diagrams and also simple equations, the author discusses relationships of tornadoes to cirronimbus, precipitation area, the field of movement, the horizontal pressure field, the various theories explaining the origin of tornadoes such as those of ROSSMANN and SHOWALTER, the mechanical theories of WEGENER and TEPPER and the thermodynamic theories of FULKS, KOSCHMIEDER and BLEEKER and DELVER. (*Same item as* 7.10–9, Oct. 1956, *MAB.*) *Subject Headings:* **1. Tornado theories 2. Tornado formation.**—*I.L.D.*

10B–53 551.576:551.515.3:551.594.11(744)

Falconer, Raymond F. and Schaefer, Vincent J., **Cloud atmospheric-electric observations of the formative stages of the Worcester, Massachusetts, tornado.** *American Meteorological Society,*

Bulletin, 35(9):437–440, Nov. **1954.** 3 figs., 3 refs. **DWB**—Photographs of the storm cloud associated with the Worcester tornado between 1355 and 1405, June 9, 1953, and charts of atmospheric electricity, solar radiation, wind direction, and velocity associated with June 9, 1953 tornado and, for contrast, with high winds and visible dust on April 23, 1953, are presented and analyzed. (*Same item as* 6.9–165, Sept. 1955, *MAB.*) *Subject Headings:* **1. Tornado clouds 2. Atmospheric electricity 3. Tornado, Worcester, Mass. (June 1953) 4. Worcester, Mass.**—*I.L.D.*

10B–54 551.515.3:551.515.8(73/9)

*Fawbush, Ernest J. and Miller, Robert C. (*Tinker A. F. Base, Okla.*), **The types of air masses in which North American tornadoes form.** *American Meteorological Society, Bulletin*, 35(4):154–165, April **1954.** 12 figs., 4 tables, 14 refs. **DWB**—Examples and statistics are presented, taken from results of an analysis of 286 soundings obtained in connection with tornadoes which have occurred in several parts of the U. S. are presented. Three types of air masses in which tornadoes may form are distinguished. The usual type with moist layer at 850–500 mb and very dry air above and winds increasing with altitude is characteristic of the Great Plains tornadoes. Type II is found in the region of the Gulf of Mexico and adjacent states from Texas to Florida. No stable area or inversion occurs above the moist layer. Steep lapse rates, high humidities and decreasing winds with height are characteristics which identify the air mass. Tornadoes occur in only a few of the thunderstorms in an area, and they never last long. Type III is found in California and Oregon, and is characterized by cool moist air to great heights with steep lapse rates (conditionally unsteady) and winds increasing with height. None are severe, nor do they occur in families. (*Same item as* 6.6–188, June 1955, *MAB.*) *Subject Headings:* **1. Tornado air masses 2. Tornado statistics 3. Air masses 4. United States.**—*M.R.*

10B–55 551.515.3(73/9)(02)

†*Flora, Snowden Dwight, **Tornadoes of the United States.** 2nd rev. ed. Norman, Oklahoma, Univ. of Oklahoma Press, **1954.** 221 p. tables, figs., photos, refs. throughout. **DWB**—This is the first complete book on this most devastating meteorological phenomenon. The author has lived for most of his lifetime in Kansas, the state with the greatest number of recorded or reported tornadoes. The book contains a great amount of statistical, synoptic and meteorological information. Among the chapters are one on causes and structure, on the destructive force, on forecasts and warnings, times and places of occurrence, safety precautions, freaks, notable disasters, etc. Many excellent photographs of tornadoes and related events, and maps showing tornado statistics are included. The first edition was published only a year earlier, but so much data accumulated during that time that many chapters had to be revised for the new edition and the statistical section enlarged (for abstract on first edition, *see* 4.8–8, Aug. 1953, *MAB*). The section on forecasting gives the facts and consequences of warnings issued by the Weather Bureau prior to the San Angelo and Waco, Texas and the Cleveland, Ohio tornadoes of 1953. Full descriptions of these and the Flint, Mich., and Worcester, Mass., tornadoes are given in the chapter on **Outstanding disasters.** (*Same item as* 6.3–2, March 1955, *MAB.*) *Subject Headings:* **1. Tornadoes 2. Tornado damage statistics 3. Textbooks 4. United States.**—*M.R.*

10B–56 551.501.8:551.515.3(773)

§Huff, F. A.; Hiser, H. W. and Bigler, S. G., **Study of an Illinois tornado using radar, synoptic weather and field survey data.** Illinois. State Water Survey Div., Report of Investigation, No. 22, **1954.** 73 p. 29 figs., 3 tables, 11 refs. **DLC**—A most thorough analysis of the meteorological factors attending the tornado of April 9, 1953 which passed just N. of Champagne-Urbana, Ill., and of the radar (P.P.I) photographs which show a tail forming a distinctive curl and "eye" such as had never before been photographed on a radar scope. Not every such tail forms into a tornado curl and possibly numerous tornadoes would not appear as curls or tails on the P.P.I., but it does give an index to activity that coincided with the path of the tornado for a distance of 25 or 30 mi (dozens of P.P.I. photos are included as well as synoptic charts, photos of damage, etc.). (*Same item as* 6.3–36, March 1955, *MAB.*) *Subject Headings:* **1. Tornado analysis 2. Radar tornado photographs 3. Urbana, Ill.**—*M.R.*

10B–57 551.515.3

Kangieser, Paul C., **A physical explanation of the hollow structure of waterspout tubes.** *Monthly Weather Review*, 82(6):147–152, June **1954.** 8 figs., 7 refs., 3 eqs. **DWB**—Experimental observations were made on the behavior of minute foreign particles such as vapor from steaming water surfaces, spray particles and fine sawdust, introduced into a mechanically produced vortex. Phenomena resembling naturally occurring vortexes are observed, and the physical basis of the hollow interior is a result of the equilibrium established between the centrifugal and drag forces on the particle. This assumption is developed quantitatively and a model explaining the development of a waterspout, namely the Rankine combined vortex, is proposed. A similar explanation is proposed

for tornadoes and dust devils. (*Same item as* 6.9–166, Sept. 1955, *MAB.*) *Subject Headings:* **1. Waterspout models 2. Vortexes.**—*I.L.D.*

10B–58 551.515.3

Markgraf, Hans, **Ein Beitrag zu Wegener's mechanischer Tromben Theorie.** [Contribution to Wegener's mechanical theory of tornadoes.] *Meteorologische Zeitschrift*, 45(10):385–388, **1928.** refs. **DWB**—Translation into English by Paul C. Kangieser, issued by U. S. Weather Bureau, Oct. **1954.** Typescript. **DWB**—Comments on WEGENER's paper (*see* E–46, May 1950, *MAB*) which developed the theory that tornadoes occur when strong convective currents penetrate a layer of strong wind shear. The model allows two tornadoes to form in such a cloud—one with cyclonic (to the right) and one with anticyclonic vorticity (to the left). The latter are inhibited in several ways—hence the preponderance of cyclonic tornadoes. A horizontal roll cloud or vortex across the cloud is also predicted, though this occurs in late stages and may be absent. Numerical estimates of slant upward speeds or vertical velocities are given (some from actual cases) to test the order of magnitude of the forces. (*Same item as* 8.1–213, Jan. 1957, *MAB.*) *Subject Headings:* **1. Tornado theories. I. Kangieser, Paul C.** (*trans.*) **II. Wegener, Alfred.**—*M.R.*

10B–59 551.509.5:551.515.3 551.557.5:551.515.3

Mook, Conrad R., **A preferred thickness line accompanying multiple tornado occurrences.** *Monthly Weather Review*, 82(6):160–162, June **1954.** 5 figs., 9 refs. **DWB**—It is shown that the 18,600 ft contour line appears on the 1000–500 mb charts at the center of tornado areas compiled from composite charts of tornadoes in several sections of the South or Central United States. This existence of preferred thickness patterns is possibly connected with zones of maximum gradient and hence "jet stream" type wind shear structure. (*Same item as* 7.1–176, Jan. 1956, *MAB.*) *Subject Headings:* **1. Tornado forecasting 2. Thickness patterns 3. Jet stream-tornado relationships.** —*M.R.*

10B–60 551.515.3:551.541(781)

Newstein, Herman (*Severe Local Storm Res. Unit, U. S. W. B.*), **Tornado-pressure jump line situation of March 18, 1954.** *Monthly Weather Review*, 82(9):255–256, Sept. **1954.** 3 figs. **DWB**—The results of an analysis of eight pressure jump reports, associated with the tornadoes of March 18, 1954 in eastern Kansas are presented. Isochrones of pressure jump line with tornado locations are shown on maps. The remarkable agreement in time and space between tornadoes and isochrones is shown graphically. (*Same item as* 7.11–183, Nov. 1956, *MAB.*) *Subject Headings:* **1. Pressure jump 2. Tornado location 3. Eastern Kansas.**—*I.L.D.*

10B–61 551.515.3(439.1)

§Ozorai, Zoltán, **Pusztító szélvihar Tata környékén.** [Destructive storm near Tata.] *Időjárás*, 58(3):190–192, May/June **1954.** 4 figs. **DWB**—The tornado (a rare phenomenon in Hungary) which took place in western Hungary on May 7, 1954, affected a territory 5–6 km in length and 100 m in width. The synoptic situation over Europe and Hungary before and during the storm is discussed in detail and illustrated by charts. Progress of the storm and damage along its path are described. (*Same item as* 6.6–189, June 1955, *MAB.*) *Subject Headings:* **1. Tornadoes 2. Tata, Hungary.** —*G.T.*

10B–62 551.515.3(47)

§Remizov, G. A., **Tornado pod Moskvoĭ.** [Tornado near Moscow.] *Priroda*, Moscow, 43(8): 100–102, Aug. **1954.** 4 figs. **DLC**—A rare (in this zone of moderate climate), typical case of tornado which occurred on Aug. 17, 1951 in the Khimki District of Moscow region is described. Although the path of the tornado was short and its width only from 200 to 1000 m the storm was very violent and uprooted and damaged a great number of trees. It was accompanied by heavy precipitation (48 mm) and at some places by thunder, lightning and hail (pigeon egg size). One vortex, shaped like an elephant trunk was seen to touch the earth. A detailed description of the synoptic situation (with charts) before and after the passing of the tornado gives a complete picture of the phenomenon. (*Same item as* 6.7–187, July 1955, *MAB.*) *Subject Headings:* **1. Tornadoes 2. Synoptic conditions for tornadoes 3. Khimki District, Moscow, U.S.S.R.**—*A.M.P.*

10B–63 551.515.31

Rossmann, Fritz O. (*Air Force Missile Test Center, Patrick AFB, Fla.*), **Physical processes in the development of tornadoes and consequences which influence their dissipation.** Miami, Florida, Pan American World Airways, Latin American Division, March 4, **1954.** 7 p. 4 figs., eqs. **DWB**—Criteria determining both the origin of tornadoes and their dynamic forces are developed through physical insight and computation of their wind speeds. The physical theory is found on numerous observations of specific cases both in Europe and in the U. S. where, in recent years, an unusually

large number of tornadoes occurred. It will be demonstrated that there is no updraft in the funnel of a tornado, as is generally assumed, but that there is a strong downdraft caused by moist labile conditions and stabilized by the revolving motion of the air mass in the tornado funnel. This seems to present the only way to evolve a theory of tornadoes without finding any contradictions in conditions and facts characterizing the shape and destructive powers of tornadoes anywhere in the world. (*Same item as* 6.2–153, Feb. 1955, *MAB.*) *Subject Headings:* **1. Tornado dynamics 2. Tornado formation 3. Tornado theories.**—*Author's abstract.*

10B–64 551.509.317:551.515.3(766)

§Sugg, A. L. and Foster, D. S., **Oklahoma tornadoes, May 1, 1954.** *Monthly Weather Review*, Wash., D. C., 82(5):131–140, May **1954.** 28 figs., 18 refs., 2 appends. **DWB**—The discussion covers the synoptic features that preceded the tornadoes, the small scale features such as the advance of the warm front over S.E. Oklahoma and acceleration of the cold front over Western Texas, the thermodynamic characteristics of the atmosphere as revealed by radiosonde analysis and the nature of the Weather Bureau forecasts. The method of radiosonde analysis for severe local storms and tornado forecasting and a method for analyzing and forecasting the stability index field are described in appendices. (*Same item as* 6.8–111, Aug. 1955, *MAB.*) *Subject Headings:* **1. Synoptic conditions for tornadoes 2. Thermodynamics of the atmosphere 3. Tornado forecasting 4. Upper air analysis 5. Oklahoma.**—*I.L.D.*

10B–65 551.515.3:551.541

*Tepper, Morris, **Pressure jump lines in midwestern United States, Jan.–Aug. 1951.** *U. S. Weather Bureau, Research Paper*, No. 37, June **1954.** 70 p. 52 figs. (incl. photos), 13 tables, 10 refs., eqs. Price: $0.45. **DWB**—Investigation based on a dense tornado and severe storm observational network concentrated in Kansas and Oklahoma. Accelerated microbarographs were mainly used for the analysis; in addition, radar, upper air soundings and a press clipping service were utilized. A statistical summary shows monthly and geographical distribution of pressure jump lines, location and time of isochrones, orientation track, duration, length and width of path and average speed as well as a correlation of these parameters and their relation to synoptic pattern. Severe local storms are definitely related to pressure jump lines and are usually located near the maximum "intensity-amplitude value of the pressure jump." Three case studies are presented and analyzed in relation to theoretical considerations, giving also the location of precipitation areas, synoptic maps at different heights, atmospheric line sections up to 400 mb and, finally, some photographs of radar scope presentation. A short analysis of radar data concludes the study. (*Same item as* 7.3–191, March 1956, *MAB.*) *Subject Headings:* **1. Pressure jump 2. Tornadoes 3. Microbarographs 4. Radar weather analysis 5. Kansas 6. Oklahoma.**—*A.A.*

1955

10B–66 551.515.3/4(42)

§Abbott, S. G., **The thunderstorms and tornadoes of 8 December 1954.** *Weather*, 10(5):142–146, May **1955.** 2 figs., 2 photos, table, ref. Also: Bull, G. A. and Harper, W. G., **West London tornado, December 8, 1954.** *Meteorological Magazine*, London, 84(1000):320–322, Oct. **1955.** 2 photos, table, ref. **DWB**—The synoptic chart for Dec. 8, and upper air conditions over S.E. England are shown. Severe thunderstorms developed in Mp air in the rear of the occlusion and tornadoes occurred in Dorset and between the Isle of Wight and London, one passing through N.W. London. The damage is believed to be commensurate with that caused by American tornadoes. (*Same item as* 6.10–144, Oct. 1955 and 7.3–162, March 1956, *MAB.*) *Subject Headings:* **1. Thunderstorms 2. Tornadoes 3. England.**—*C.E.P.B., G.T.*

10B–67 551.511:551.515.31

Abdullah, Abdul Jabbar (*N. Y. Univ. Dept. of Met.*), **Some aspects of the dynamics of tornadoes.** *Monthly Weather Review*, Wash., D. C., 83(4):83–94, April **1955.** 3 figs., 2 tables, 17 refs., 38 eqs. **DWB**—In this paper an attempt is made to construct a dynamical model for a tornado that may explain some of its known features. The assumption is made that a tornado is dynamically equivalent to a combination of a pure sink and a pure vortex in the hydrodynamic sense. The compressibility of the air is taken into account, but the air is assumed to be dry. Friction is neglected and the motion induced by the disturbance is assumed to be horizontal. It is found that, because of the compressibility of the air, the flow is separated into three main regions, an outer region in which the flow is subsonic, an innermost region which cannot belong to the outer flow, and a middle region that separates the two, in which the flow is supersonic. Formulas are derived by which the radii of these regions may be computed. The minimum possible pressure and the maximum possible speed are computed. The vertical shape of the funnel is also computed on the assumption that it is parallel to the surface of the critical flow. (*Same item as* 7.3–163, March 1956, *MAB.*) *Subject Headings:* **1. Tornado dynamics 2. Tornado models 3. Vortexes.**—*Author's abstract.*

10B–68 551.515.3(862):551.501

Alpert, Leo (*Capitol Res. and Dev. Corp., Arlington, Virginia*), **Panama tornadoes.** *American Meteorological Society, Bulletin*, 36(4):171–172, April **1955.** 3 figs. **DWB**—With the aid of photographs, the author describes two tornadoes observed by him in Panama on June 10, 1943 and in July 1942. The rainfall in both cases was behind the tornado cloud. The "collar" phenomena was not observed. (*Same item as* 7.5–129, May 1956, *MAB.*) *Subject Headings:* **1. Tornado observation 2. Panama.**—*I.L.D.*

10B–69 551.515.3(766)

Asp, M. O. (*U. S. W. B., Little Rock, Ark.*), **Surface weather conditions relating to the occurrence of tornadoes in Oklahoma.** Paper presented at A.M.S., National Meeting, K.C., Mo., June 8–10, **1955.** 4 p. 3 figs., 2 tables. Mimeo. **DWB**—Relationships between tornado occurrence during each month and temperatures, dew points, pressure, sky conditions, weather and wind at time of a tornado within 10 mi or 40 mi of observing station are discussed and shown in graphs and tables for 121 tornadoes in Oklahoma. A brief list of empirical rules are extracted from data. Although the range of occurrences for each element is wide, it was found that a high positive correlation existed between tornado occurrence and temperature or dew point irrespective of whether or not the tornado was <10, 10–20 20–30, 30–40, 40–50 or >50 mi away. (*Same item as* 8.4–197, April 1957, *MAB.*) *Subject Headings:* **1. Synoptic conditions for tornadoes 2. Objective tornado forecasting aids 3. Tornado data 4. Oklahoma.**—*M.R.*

10B–70 551.515.31

Bates, Ferdinand C., **Model for the genesis of tornadoes based on the rapid subsidence of a wet cloud layer.** U. S. Weather Bureau, Feb. 26, **1955.** 8 p. 3 figs., 2 refs., 7 eqs. Also his: **Kinetic energy of a tornado.** U. S. Weather Bureau, Feb. 26, **1955.** 2 p. 2 figs., eqs. (Both papers bound in collection U. S. W. B. SELS Center papers.) **DWB** (M15.3 U587sh)—In the first paper it is proposed that the potential energy created by the evolution of a cold layer through the rapid subsidence of a wet cloud layer is converted to the kinetic energy of the tornado through central perforation of the cold layer and peripheral drainage within a radius range of about 10 to 15 mi. An energy calculation is made on an hypothesized case. Several phenomena frequently observed attendant to tornadoes that apparently support the model are pointed out. In the second paper a model is developed for calculating the kinetic energy of a tornado vortex (a rotating cylindrical shell of height "h," with a solid body of rotation) from center to a radius of maximum wind and conservation of angular momentum from there on out to where the wind falls to 1% of the maximum. Radial and vertical components of wind are neglected. A graph is presented for $KE = 4.85\pi phv_R^2 R^2$ on log paper, giving KE in gram cal. for various winds and radii and heights. An inset chart gives correction for variation in height from 1100 m. *Subject Headings:* **1. Kinetic energy of tornadoes 2. Tornado models.**—*M.R.*

10B–71 551.511:551.515.3

Beebe, Robert G. and Bates, Ferdinand C. (*Kansas City*), **A mechanism for assisting in the release of convective instability.** *Monthly Weather Review*, 83(1):1–10, Jan. **1955.** 13 figs., 16 refs., 10 eqs. **DWB**—A model is proposed as one means whereby an air mass characterized by the "typical" tornado sounding is converted to one described by the type of sounding observed in the vicinity of a tornado. By considering certain indications of the vorticity equation, it is possible to analyze configurations of jet axes and jet maxima such that low-level (850 mb) convergence is surmounted by higher-level (500 mb) divergence. Thus a model of jet structures is described which assists in, or possibly in some cases effects, the release of convective instability through vertical stretching or lifting. An example is presented to illustrate the use of this model in tornado forecasting and methods of application are outlined. (*Same item as* 6.9–142, Sept. 1955, *MAB.*) *Subject Headings:* **1. Convergence and divergence 2. Instability 3. Tornado dynamics.**—*Authors' abstract.*

10B–72 551.515.3(778)

Beebe, Robert G. (*SELS Center, W. B. Airport Station, Kansas City, Mo.*), **A tornado development, 17 August 1953.** *American Meteorological Society, Bulletin*, 36(7):344–347, Sept. **1955.** 9 figs. (incl. photos). **DWB, DLC**—Photographs showing the development of the tornado funnel are reproduced and a surface map and nearby soundings are presented. *Subject Headings:* **1. Tornado formation 2. Tornado photographs 3. Kansas City, Mo.**—*I.L.D.*

10B–73 551.515.3

Brooks, Edward M. (*Inst. of Tech., St. Louis Univ.*), **Progress in the study of tornadoes during 1954.** *Weatherwise*, 8(1):20–21, Feb. **1955.** **DWB**—The author presents a summary of the papers on tornadoes that were presented at the Miami Beach meeting of the American Meteorological Society, Nov. 17–19, 1954. *Subject Headings:* **1. Tornadoes 2. American Meteorological Society.** —*I.L.D.*

10B–74 551.515.3(744)

Brooks, John, **Reporter at large. Five-ten on a sticky June day.** *New Yorker*, N. Y., 31(15):39–69, May 28, **1955. DLC**—A vivid but accurate report on the nature of tornadoes, with special regard to the Worcester, Mass., tornado of June 9, 1953 when 90 people were killed and 436 injured seriously. The failure to forecast the tornado, in spite of signs which indicated such violent storms were probable in the area, is attributed to the fact that such a disaster had never occurred before in historical times, so the forecasters did not want to unduly alarm the public. Furthermore, no indication of the disaster reached the Weather Bureau on teletype circuits until over an hour after the tornado struck Worcester. The report was compiled from interviews with numerous officials and individuals in and outside the disaster area. (*Same item as* 7.2–142, Feb. 1956, *MAB.*) *Subject Headings:* **1. Tornado, Worcester, Mass. (June 1953) 2. Tornado statistics 3. Worcester, Mass.**—*M.R.*

10B–75 551.515.3:551.515.8

De Jong, J. J. G., **Ontstond een windhoos in gebied waar twee buien elkaar ontmoetten?** [Did a tornado arise in a region where two squalls came together?] *Hemel en Dampkring*, The Hague, 53(8/9):168–170, Aug./Sept. **1955.** 3 figs. (incl. photos), 2 refs. **DWB, DLC**—During a squall which moved over southwestern Friesland, conditions forced the formation of a tornado which caused great damage at Huis ter Heide. Evidence is presented that two squalls traveling southwest and west and encountering each other produced powerful winds. This phenomenon agrees with the theory of BLEEKER and DELVER that the probability of the occurrence of powerful tornadoes which originate in micro-depressions is very great in regions between the squalls. (*Same item as* 7.11–179, Nov. 1956, *MAB.*) *Subject Headings:* **1. Tornado theories 2. Tornadoes associated with squalls 3. Huis ter Heide, Netherlands.**—*I.L.D.*

10B–76 551.515.3(44)

Delpech, L., **Sur une trombe à Chartres-de-Bretagne (I.-et-V.), le 22 mars 1955.** [A tornado at Chartres-de-Bretagne (Ille-et-Vilaine), March 22, 1955.] *La Météorologie*, Paris, Ser. 4, No. 40:317–323, Oct./Dec. **1955.** 7 figs., eqs. **DWB**—A tornado in central France is described with detailed explanation of the mechanics of damage done to buildings, trees and gravestones. The trajectory is shown in sketches with indication of the direction of action at various points. The attending synoptic situation is discussed. (*Same item as* 8.4–198, April 1957, *MAB.*) *Subject Headings:* **1. Tornadoes 2. Chartres-de-Bretagne, France.**—*G.T.*

10B–77 551.509.31:551.515.8

§Fujita, Tetsuya (*Kyushu Inst. of Tech.*), **Results of detailed synoptic studies of squall lines.** *Tellus*, Stockholm, 7(4):405–436, Nov. **1955.** 48 figs., 17 refs., eqs. **DWB, DLC**—A system of synoptic analysis on a mesometeorological scale has been developed through the combined use of space and time sections applied to all regular and special stations in an area 500 by 900 mi in the central part of the U. S. Two periods of development of large thunderstorm areas are analyzed. In both of these periods tornadoes occurred. The synoptic model of a squall line in this scale involves three principal features of the pressure field: the pressure surge, the thunderstorm high and the wake depression. Another feature, called the tornado cyclone, accompanies tornado funnels. Divergence values of 10 to 60.10^{-5} sec^{-1} over areas of 100 to 10,000 sq mi are measured. The mesosynoptic disturbances greatly influence the situation as viewed on the regular synoptic scale, which is about 10 times the meso-scale, and make conventional analysis hopelessly difficult. (*Same item as* 7.9–104, Sept. 1956, *MAB.*) *Subject Headings:* **1. Synoptic analysis 2. Squall lines 3. Tornadoes associated with squalls.**—*Author's abstract.*

10B–78 551.515.31

†Fulks, J. R. (*U. S. W. B., Wash., D. C.*), **On the mechanics of the tornado.** Wash., D. C., U. S. Weather Bureau, July **1955.** 66 p. 7 figs., table, 32 refs., eqs. Photostat of typescript. **DWB**—A logical review of theories of the dynamics of tornado formation with respect to the parent thunderstorm cell. Vorticity shear and minimum exchange, vertical motion, divergence, surface friction, buoyancy, etc., are all considered in the model presented. The forces seem to be of the right order of magnitude if the vortex extends to great heights. *Subject Headings:* **1. Tornado models 2. Tornado dynamics.**—*M.R.*

10B–79 551.515.3(763,767)

Kaplan, Henry G. (*W.B.A.S., La Guardia Field, N. Y.*), **Analysis of the Arkansas-Louisiana tornado situation of Jan. 3, 1949.** U. S. Weather Bureau, [**1955?**]. 6 p. fig., 5 refs. Photostat of typescript. **DWB**—Analysis of tornado which hit El Dorado, Ark., Warren, Ark., and Haynesville, La., on Jan. 3, 1949 (*ca.* 1745C). Shreveport and Nashville RAOB soundings for 0300Z on Jan. 4, 1949 are presented to show air of tropical maritime origin with warm front surface at 900 mb

Nashville) and high dew points up to 575 mb, and a dry layer from 850 to 700 mb at Shreveport. At 750 mb a dew point difference of 11°C occurred between the two stations. The mechanism of tornado formation is by intrusion of a tongue of dry air into mt (moist) air, and a nearby thunderstorm to provide rapid cooling of moist layers by snow falling through them. (*Same item as* 7.11–180, Nov. 1956, *MAB.*) *Subject Headings:* **1. Tornado analysis 2. Arkansas 3. Haynesville, La.**—*M.R.*

10B–80 551.509.32:551.515.31

§Lee, Jean T. (*U. S. W. B. Airport Station, K. C., Mo.*), **Thunderstorms and tornadoes of February 1, 1955.** *Monthly Weather Review*, Wash., D. C., 83(2):45–51, Feb. **1955.** 10 figs., 3 refs. **DWB**—A synoptic-aerological analysis of the situation on Jan. 31 and Feb. 1, 1955 which gave rise to the first severe storms and tornadoes of the season in the Little Rock-Memphis area and to the eastward in Mississippi and Alabama. Over 125 people were injured and 23 killed. The tornadoes occurred in the center and to the east of the area for which tornadoes were forecast at 0900 CST. Those which proved fatal were all within the forecast area. Frontal, surface (3-hourly), 850, 700, 500 mb and adiabatic charts are presented. A bubble of moist air not advected but probably of convective origin appearing at 0900, Feb. 1 at Little Rock was one of the strongest indications although Showalter Stability Index, etc. all indicated tornado activity. (*Same item as* 8C-23, March 1957, *MAB.*) *Subject Headings:* **1. Tornado forecasting 2. Tornado analysis 3. Lower Mississippi Valley.**—*M.R.*

10B–81 551.515.3:551.501.81

Montgomery, Floyd C., **Tornadoes at Blackwell, Okla., May 25, 1955.** *Monthly Weather Review*, 83(5):109, May **1955.** Also his: **Some observations on the tornado at Blackwell, Oklahoma, 25 May 1955.** *Weatherwise*, 9(3):97, June **1956.** illus. Also: Phillips, Victor V.; Galway, Joseph G. and Hanson, Donald M., **Tornadoes of Blackwell, Oklahoma-Udall, Kansas, May 25, 1955.** *Monthly Weather Review*, 83(10):224, 238, Oct. **1955.** fig. Also: Staats, Wayne F. and Turrentine, Charles M., **Some observations and radar pictures of the Blackwell and Udall tornadoes of May 25, 1955.** *American Meteorological Society, Bulletin*, 37(10):495–505, Dec. **1956.** 25 figs., 5 refs. **DWB**—The first two articles are descriptions of phenomena observed from a storm cellar 9 blocks west of the tornado path. The third article is a collection of eye witness accounts. The fourth paper includes an analysis of radar photographs prepared under the sferics project of Oklahoma A. and M. College. (For more detailed abstracts, *see* 7.11–182, Nov. 1956, 9.10–106, Oct. 1958, 8.4–200, April 1957 and 8.11–125, Nov. 1957, *MAB.*) *Subject Headings:* **1. Tornadoes, Oklahoma-Kansas (May 1955) 2. Radar analysis of tornadoes 3. Blackwell, Okla. 4. Udall, Kansas.**—*G.T.*

10B–82 551.515.8:551.515.3(744):551.501.81

Penn, Samuel; Pierce, Charles and McGuire, James K. (*U. S. W. B., Boston*), **The squall line and Massachusetts tornadoes of June 9, 1953.** *American Meteorological Society, Bulletin*, 36(3):109–122, March **1955.** 26 figs. (incl. photos), 4 refs. **MH–BH**—Some features of the squall line situation of June 9, 1953 and accompanying tornadoes in central and eastern Massachusetts are discussed. From radarscope photographs, it is pointed out (1) that the Worcester tornado and the Franklin-Wrentham tornado each occurred in the right-rear quadrant of a squall-line thunderstorm cell, and (2) that this relative position, with an associated tail or hook in the radar echo, is similar to that of the Illinois tornado of April 9, 1953. A tentative explanation is suggested for tornado formation in this position. (*Same item as* 6G–215, July 1955, *MAB.*) *Subject Headings:* **1. Tornadoes 2. Line squalls 3. Radar echoes from tornadoes 4. Massachusetts.**—*Authors' abstract.*

10B–83 551.501.81:551.515.3(262.5)

Popov, N. I., **Smerchi na poberezh'e Chernogo moria.** [Tornadoes over the Black Sea coast.] *Meteorologiia i Gidrologiiâ*, Leningrad, No. 5:35–37, Sept./Oct. **1955.** 5 figs. **DWB, DLC**—The author describes in detail the radar observations on four tornadoes which occurred from July 22 to Sept. 29, 1954 on the Caucasian coast of the Black Sea. A diagram of the radarscope of the Sept. 29 tornado, photographs of the tornadoes and maps of their movement are presented. (*Same item as* 8.5–204, May 1957, *MAB.*) *Subject Headings:* **1. Tornado observations 2. Radar tornado photographs 3. Black Sea.**—*I.L.D.*

10B–84 551.515.3(492) 551.553.8(492)

Postma, K. R., **Wind- en water-hozen op 9 Augustus 1955.** [Wind- and water-spout of Aug. 9, 1955.] *Hemel en Dampkring*, The Hague, 53(10):185–189, Oct. **1955.** 8 photos. **DLC, DWB**—The author presents a series of photographs showing the development of a tornado and a waterspout above the Wâddenzee between Terschelling and Vlieland and discusses the atmospheric conditions, especially pressure and winds preceding and during the occurrence of these phenomena and the possible causes of spouts. (*Same item as* 8.1–216, Jan. 1957, *MAB.*) *Subject Headings:* **1. Tornadoes 2. Waterspouts 3. Netherlands.**—*I.L.D.*

10B–85 551.515.3

†Stowell, David J. (*Natl. Weather Analysis Center*), **Tornado theory.** *U. S. Weather Bureau, Research Report*, R-3.1, Dec. 12, **1955.** 15 p. 3 figs., 35 refs. **DWB**—Tornado theories as revealed by literature since FRANKLIN (1753) and ESPY [1841] are reviewed in some detail; extreme theories (electrical, volcanic, etc.) as well as classical (FERREL and HUMPHREYS) and the downdraft theory of JAKL and others considered, and recent evidence in support of the cool air descent mechanism presented in full, leading to a mathematical model. SHOWALTER's definition of conditions favorable for tornado development are given considerable prominence in relation to practical forecasting application. The tornado process is said to be the opposite of that which produces dust devils. *Subject Headings:* **1. Tornado theories 2. Tornado literature.**—*M.R.*

10B–86 551.515.3:551.515.8

§Théveneau, A., **Étude d'un cas de perturbation d'hiver du front des Alizés.** [Study of a case of winter perturbation of the trade wind front.] *Rabat, Morocco. Institut Scientifique Chérifien. Service de Physique du Globe et de Météorologie, Annales*, 15:107–114, **1949,** pub. **1955.** fig. **DWB**—A cold air mass passing over the area caused a number of waterspouts at Rabat (evolution shown schematically and synoptic charts presented for Dec. 12, 1949). Snow showers occurred locally in connection with the front. *Subject Headings:* **1. Synoptic studies 2. Waterspouts 3. Rabat, Morocco.**—*M.R.*

10B–87 551.509.32:551.515.3

*U. S. Air Weather Service, **Tornadoes and related severe weather: an informational digest for air commanders, revised June 1955.** Wash., D. C., U. S. Air Force, **1955.** 8 p. fig., 2 charts, table. **DWB**—A review of methods of tornado, hail and severe thunderstorm forecasting, with charts showing frequencies of tornadoes per 50-mi square, and of tornadoes sighted within 60 mi of an Air Force base (1920–49) throughout the U. S. The greatest frequency (>15) was in eastern Kansas and western and central Iowa. Tornado forecast verifications for each year 1948–54 are given in a table. About 90% or over of the forecasts of tornadoes in 1948–51 verified, and about ⅔ of those in 1952–54, years of much greater tornado frequency. A few cases each year (11–13) occurred when no forecast of tornadoes was issued. (*Same item as* 8C–32, March 1957, *MAB.*) *Subject Headings:* **1. Tornado forecasting 2. Tornado forecast verification 3. Tornado frequencies 4. United States.**—*M.R.*

10B–88 551.501.9:551.541

U. S. Air Weather Service, **United States Weather Bureau Pressure-Jump Program.** Its *AWS Regulation*, No. 55-30, June 14, **1955.** 2 p. **DWB**—Brief instructions for observers in pressure jump network, followed by a list of 27 Air Weather Service Stations which participate in the pressure-jump Program of the U. S. W. B. The stations range from New Mexico to Maine and Florida. *Subject Headings:* **1. Pressure jump networks 2. Tornado warning networks 3. U. S. Weather Bureau networks 4. Instructions for observers.**—*M.R.*

10B–89 551.515.3(73/9)

U. S. Weather Bureau, **Average monthly variation in tornado frequency, based on a total of 6970 tornadoes, period 1916–1954.** Wash., D. C., U. S. Weather Bureau, July **1955.** map (fold.). **DWB** (M15.3 U587ab)—A large map of the U. S. with histograms pasted on each state showing monthly frequency of tornadoes for period 1916–1954 (39 years) based on 6970 tornadoes. Annual average for U. S. was 179.36; for Kansas 23.05; for Rhode Island, Utah, Nevada, Delaware, Washington and Oregon 0.15 or less. May and June are months of highest frequency in Northern Plains, April and May in Southern Plains, and March and April in Deep South. (*Same item as* 8.10–150, Oct. 1957, *MAB.*) *Subject Headings:* **1. Tornado frequency charts 2. United States.**—*M.R.*

10B–90 551.541:551.515.3

U. S. Weather Bureau, **Evaluation of the Weather Bureau Pressure Jump Reporting Program.** April **1955.** 13 p. 14 figs. **DWB**—The Pressure Jump Program has been in effect for 2 years (1953–54). Statistical and graphical evaluation of results of records from scores of stations with special barographs has shown that one out of four analyzed pressure jump lines had a tornado in its path. More than half of the known tornadoes and waterspouts fell on a PRJMP line and of these almost three-quarters agreed within one hour with time of isochrone of a PRJMP line. Some were analyzed on the basis of only 2 or 3 reports so there is a chance some lines had dissipated. A good pressure jump indicator has been developed by the Instrument Division of the U. S. W. B. It will register an alarm when a pressure jump ≥.005″ Hg/min and at least .02″ total occurs. (*Same item as* 8.1–218, Jan. 1957, *MAB.*) *Subject Headings:* **1. Pressure Jump Program evaluation 2. Pressure jump networks 3. Pressure jump indicators 4. Tornado-pressure jump relationships.**—*M.R.*

10B–91 551.501.81:551.515.3(08)

U. S. Weather Bureau, **Panel discussion of tornado problems held at the 133rd National Meeting of the American Meteorological Society in Miami, Florida, Nov. 18, 1954.** C. F. Van Thullenar, moderator. Wash., D. C., Feb. **1955.** 58 p. 14 figs. (incl. photos). **DWB**—The discussion given here by the 13 panel members listed, resulted in a general agreement on the need for improved methods of tornado observations, particularly instrumental ones aimed at (1) the tornado itself and (2) the atmosphere enclosing its breeding place. Radar observations and new electronic equipment, such as the "Tornado meter" and the "Black box," promise increased knowledge of atmospheric instability and structure generally assumed to provide the trigger necessary for tornadoes and other severe storms. (*Same item as* 6G–229, July 1955, *MAB.*) *Subject Headings:* **1. Radar tornado detection 2. Tornado symposia. I. American Meteorological Society II. Van Thullenar, C. F.**—*W.N.*

10B–92 551.515.3(782)

Van Tassel, Edgar L. (*W. B. Airport Station, Scottsbluff, Nebr.*), **North Platte Valley tornado outbreak of June 27, 1955.** *Monthly Weather Review*, Wash., D. C., 83(11):255–264, Nov. **1955.** 12 figs. (incl. photos). **DWB, DLC**—The largest and most devastating tornado in the history of western Nebraska occurred on June 27, 1955, in the North Platte Valley. The storm path and damage are described and two personal accounts of encounters with the center are presented. Selected pictures from a large collection of photographs are reproduced and used to determine the width and height of the funnel and of other features. Radar pictures show the characteristic "hook" or "number 6" appearance of the associated cloud. Aerial photographs of unusual markings apparently made by the tornado on a field near Scottsbluff are scaled and used with certain assumptions to obtain an estimated surface wind of 484 mph in the funnel. Information is given on observed downdrafts, sense of wind rotation, shape of the cloud protuberance, and associated weather conditions. (*Same item as* 7.9–152, Sept. 1956, *MAB.*) *Subject Headings:* **1. Tornado observation 2. Tornado tracks 3. Tornado photographs 4. North Platte Valley, Nebr.**—*Author's abstract.*

1956

10B–93 551.515.3

Beebe, Robert G., **Jacksonville tornado.** *Weatherwise*, Boston, 9(3):80–82, June **1956.** fig., 2 photos. **DWB**—Description of a tornado which struck Craig Airport at Jacksonville, Fla., at 1824 EST on Dec. 13, 1954, demolishing airplanes, a bus, a jeep, the administration building, and the asphalt runway to the right of the tornado track. The low pressure in the tornado evidently caused the runway to "explode" and the winds carried the chunks to the right. To the left the runway was undamaged. Photos show damage and a diagram shows the course of tornado, jeep, planes, etc. in relation to airport. A gasoline truck just to the left of the path was undamaged. *Subject Headings:* **1. Tornado, Jacksonville (1954) 2. Jacksonville, Fla.**—*M.R.*

10B–94 551.515.31:551.509.317

§Beebe, Robert G. (*Severe Local Storms Forecast Center, U. S. W. B., Kansas City, Mo.*), **Tornado composite charts.** *Monthly Weather Review*, Wash., D. C., 84(4):127–142, April, **1956.** 8 weather charts, table, 4 refs. **DWB, DLC**—Composite charts of height (or sea level pressure), temperature, and dew point were prepared for the surface, 850, 700, and 500 mb levels for tornado occurrences in 6 different areas in the United States. Cases selected for inclusion in these composite charts were mostly based upon the occurrence of 3 or more tornadoes within any one of the 6 areas during a 12-hr period. The number of cases ranged from 17 to 66 in any one area with a total of 229 cases. These charts present a mean picture of synoptic conditions from 0 to 12 hrs before the outbreak of tornadoes for each of the 6 areas. In spite of seasonal and geographical differences in data, the similarity of patterns is striking. (*Same item as* 8.3–165, March 1957, *MAB.*) *Subject Headings:* **1. Synoptic conditions for tornadoes 2. Tornado forecasting.**—*Author's abstract.*

10B–95 551.501.81:551.515.3

Bigler, Stuart G., **Analysis of tornado and severe weather echoes.** *Weather Radar Conference, Sept. 1955, Proceedings of the Fifth . . . Conference*, p. 167–175, pub. **1956.** 4 figs., 6 refs. **DWB**—Hooked echo was a common characteristic of the most notable (Worcester, Mass.) tornado. Observations were made at short radar ranges. A combined operation of tornado observation stations was set up in the midwest (Spring 1953). Severe weather warnings and photostatic copies of logs of severe weather and other data were obtained from SWWC at Tinker Air Force Base. During the first 6 months over 760 tornadoes and funnelclouds were reported in the U. S. The Blackwell-Udall, Kansas, tornado was the worst. The over-all echo pattern had no well defined squall line within detection range. To the N., N.W. and S.W. of the station there were several funnel clouds

and tornadoes. Hail and high surface wind echoes are discussed. *Subject Heading:* **1. Radar echoes from tornadoes.**—*N.N.*

10B–96 551.515.8:551.501.81:551.509.31

Bigler, Stuart G., **Comparison of synoptic analysis and composite radar photographs of a cold front and squall line.** *Weather Radar Conference, Sept.* 1955, *Proceedings of the Fifth . . . Conference,* p. 113–119, pub. **1956.** 6 figs. **DWB**—By 1839Z Sept. 29, 1954 a cold front had developed in Oklahoma-Kansas-Missouri area. Composite pictures of the most extensive, instantaneous observations of rainfall were made. Tornadoes, hail and high surface winds soon broke out in Oklahoma. Ten tornadoes were reported between Dallas, Tex., and McAlester, Okla. A squall line was apparently formed along the western edge of the shower area by 2130Z. Precipitation in Oklahoma was located very close to the surface position of the cold front, but the major portion of the squall line formation was not associated with the particular cold front. Squall line became well defined by 0030Z and consisted of two separate lines which were easily distinguished in some areas. A low pressure area was created by storms of sufficient intensity. Radar echoes experienced a gradual merger and continued consolidation so that by 0330Z the irregular line reached a maximum length of 100 mi. This use of comparative composites is a method adopted for studying the precipitation patterns associated with all types of weather facts. *Subject Headings:* **1. Mesoanalysis of squall lines 2. Radar analysis of squalls.**—*N.N.*

10B–97 551.501.81:551.515.3(764)

Bigler, Stuart G. (*Dept. of Oceanog. and Met., A. & M. College of Texas*), **Note on the successful identification and tracking of a tornado by radar.** *Weatherwise,* Boston, 9(6):198–201, Dec. **1956.** 4 figs. **DWB**—An illustrated account of what is believed to be the first successful identification of a tornado situation (which produced damage in Bryan, Tex.) and timely warnings so that school children were kept in schools instead of being dismissed just before the storm passed over the town. The storm was in an area designated 3 hours earlier by the U. S. W. B. Forecast Center at Kansas City as a danger area for severe storms. The storm echo was picked up by the Texas A. & M. 10-cm radar about 1340 CST on the 5th of April, 1956. The tornadoes hit Bryan and College Station at 1509 with winds of 75 kn and hail. Damage was mainly to unoccupied houses and warehouses. (*Same item as* 8.9–118, Sept. 1957, *MAB.*) *Subject Headings:* **1. Radar tornado detection 2. Radar tornado photographs 3. Tornado, Bryan, Tex. (April 1956) 4. Bryan, Tex.**—*M.R.*

10B–98 551.515.3:551.513.1

§Conner, W. C. (*U. S. W. B., New Orleans, La.*), **Structure of the 500 mb jet in major tornadogenesis.** Wash., D. C., U. S. Weather Bureau, Jan. 9, **1956.** 12 p. 4 figs., 2 refs. **DWB** (M15.3 U587str)—Minimum requirements for the formation of tornadoes (in relation to 850 and 500 mb circulation) are set forth and illustrated. A study of 30 cases of major tornado days in the South (1945–54) showed that the average 850 mb jet was 48 kn and average 500 mb jet was 73 kn but the lower limit for tornado genesis is more like 30 and 45 kn, respectively. Four synoptic examples are cited. It is found that a closed cold lower trough with a jet maximum south or southeast of center and 500 mb temp. −20°C or colder in core, and strong zonal flow or a split jet are favorable for tornadoes within 300 m to right of jet or 200 mi downstream. (*Same item as* 9.3–180, March 1958, *MAB.*) *Subject Headings:* **1. Tornado genesis 2. 500 mb jet.**—*M.R.*

10B–99 551.509.52:551.501.83:551.515.3

Dickson, Edwin B., **Detection of developing tornado activity.** *American Meteorological Society, Bulletin,* 37(10):517–518, Dec. **1956.** fig., 9 refs. **DWB**—A condensed summary of findings of the Project Tornado-Sferics conducted by the Severe Weather Warning Center in 1954 and 1955, using Air Weather Service sferics stations at Altus Air Force Base, Okla., Camp Chaffee, Ark., and Smoky Hill A.F.B., Kans., and operating at 10 kc. It was found during May–Aug. 1955 that 61 out of 76 (80%) of records of "long bursts" of sferics were later verified by reports of tornadoes, usually 1–3 hrs after bursts began. The 76 fixes represent 1.7% of the total number of fixes obtained during the 4 months. Average rate of sferics in bursts was 26.2 pips/sec, the maximum 55/sec. Many tornadoes occurred, however, without 10 kc long bursts, but 80% were caught on 15 kc. (*Same item as* 8.7–139, July 1957, *MAB.*) *Subject Headings:* **1. Sferics tornado detection 2. Tornado forecasting from sferics.**—*M.R.*

10B–100 551.509.31

§Fujita, Tetsuya; Newstein, Herman and Tepper, Morris, **Mesoanalysis: an important scale in the analysis of weather data.** *U. S. Weather Bureau, Research Paper,* No. 39, Jan. **1956.** 83 p. 8 figs., 15 plates, numerous diagrs., foot-refs. **DWB**—The technique of mesoanalysis of synoptic data is demonstrated by a complete analysis of the weather situation of June 24–25, 1953 (development of a pressure jump line with associated severe weather phenomena including tornadoes) from

data of the 195-station Severe Local Storm Research Unit network operating in 10 midwestern states since 1951. From the basic pressure, temperature, wind, precipitation, cloud, radar and upper air data and severe storm reports, hourly mesomaps are constructed, showing details of the synoptic development. It is found that the macroscale cold front position does not appear on the mesomaps as a continuous front separating one regime of meteorological elements from another; significant medium scale systems, completely lost in ordinary synoptic analysis, can be identified on the mesomaps and followed from hour to hour. These medium scale features are characterized by the intensity of the gradients of meteorological elements, especially pressure and temperature. Most severe weather phenomena appear to be associated with such mesofeatures. In addition to the colored mesomaps (including an upper air chart superimposed on the surface chart), the complete data material is presented in 195 diagrams (one for each of the 67 regular and 128 cooperative stations) in an appendix occupying almost half of the report. These station time sections contain microbarograms, temperature traces and values of cloudiness, precipitation, thunderstorms, wind and other elements for the regular stations, and pressure (or pressure and temperature) traces for the cooperative stations. (*Same item as* 7.11–16, Nov. 1956, *MAB.*) *Subject Headings:* **1. Mesoanalysis 2. Synoptic analysis. I. Chicago Univ. II. Contract AF 19(604)-618.**—*G.T.*

10B–101 551.594.21:551.515.3(781)

Gunn, Ross, **Electric field intensity at the ground under active thunderstorms and tornadoes.** *Journal of Meteorology*, 13(3):269–273, June **1956.** 3 figs., 3 refs. **DWB**—Electric field meters were installed in a network 9 mi apart in Kansas. Records during the passage of the thunderstorm and tornado through Oxford and Udall on May 25, 1955 are reproduced. In the early stages the field built slowly towards negative values and recovered discontinuously to positive values by lightning flashes. Near the funnel the fluctuations were very rapid but smaller, with a flash every 5 sec. Electrically the tornado resembled a very active thunderstorm. (*Same item as* 7.10–291, Oct. 1956, *MAB.*) *Subject Headings:* **1. Thunderstorm electricity 2. Tornado electricity 3. Kansas.**—*C.E.P.B.*

10B–102 551.515.31:551.509.318

§Hanks, Howard H., Jr. and Neubrand, Georgina M. (*both, Severe Local Storms Forecast Center, U. S. W. B., Kansas City, Mo.*), **Tornadoes of April 2 and 3, 1956.** *Monthly Weather Review*, Wash., D. C., 84(4):155–162, April **1956.** 8 charts, 3 refs. **DWB, DLC**—A discussion of the synoptic situation leading to the occurrence of tornadoes on April 2 and 3 in the midwest (Wisconsin, Mich., Ill., Ind., Ky., Tenn., Ark., Miss. and Kansas) is presented. It is found that approximately the same instability and low-level moisture conditions existed on April 1, 2 and 3. Reasoning from the vorticity equation and upper-level charts suggests that a strong vertical motion field was the significant factor present on April 2 and 3, which was not present on April 1, a day without tornadoes. (*Same item as* 8.3-166, March 1957, *MAB.*) *Subject Headings:* **1. Synoptic conditions for tornadoes 2. Tornado forecasting.**—*Authors' abstract.*

10B–103 551.515.3(766, 781,778)

Hardy, William E. and Dickson, Don R. (*both, Met. Dept.*), **Report of minor storms occurring in Oklahoma, Kansas and Missouri in 1956.** Oklahoma. Agricultural and Mechanical College. Research Foundation, Contract Cwb 8693, Unnumbered Report, Dec. **1956.** each section repaged. **DWB**—Answers to questionnaires submitted by investigators from Oklahoma A. and M. after interviewing those who observed or were affected by 6 tornadoes which occurred in Oklahoma, Missouri and Kansas in 1956, and in addition results of surveys of minor wind storms and/or severe thunderstorms for the entire season are reproduced *in extenso*. *Subject Headings:* **1. Tornado surveys 2. Tornadoes, Oklahoma (1956) 3. Severe storms, Oklahoma (1956) 4. Oklahoma 5. Kansas 6. Missouri.**—*M.R.*

10B–104 551.501.83:551.515.3

*Jones, Herbert L., **Research on tornado identification: to study the sferics originating from the vicinity of tornadic activity.** Oklahoma Agricultural and Mechanical College. Div. of Engineering Research, First, 2nd, and 5th to 7th Quarterly Progress Reports, Jan. 1–June 30, **1955** and Jan. 1–Sept. 30, **1956.** 5 pieces. 26, 63, 29, 31 and 31 p. figs., tables, refs. Also: Final Report, Jan. 1, **1955**–Dec. 31, **1956.** 50 p. figs., tables, refs. **DWB** (M15.3 J777r)—A number of projects for studying sferics originating in tornado activity areas are reported in detail in this series of studies. Development of equipment, correlation with actually observed tornadoes (in Blackwell, Okla. and Udall, Kan.,, May 25, 1955, for example), and a comparison of results with high (150 kc) and low (10 kc) frequency at Stillwater, Okla. for several severe storms are discussed. During a storm on May 30, 1956 the visual strokes from cloud to ground were recorded photographically and found to synchronize perfectly with 10 kc signals. Most of the energy seems to be in the high frequency band. *Subject Headings:* **1. Tornado tracking by sferics 2. Sferics from tornadoes.**—*M.R.*

10B–105 551.515.31

Joy, Arthur F., **Riddle of the tornado.** *Flying*, N. Y., 59(2):37, 78–79, Aug. **1956.** photo. **DWB**—The theory of atmospheric electricity as the cause (rather than effect) of tornadoes is revived. Vonnegut considerations are based on early scientific works, observations and eyewitness' accounts. Reference is made to writings by SIR FRANCIS BACON (1600), ARAGO and PELTIER (1839) ORSTED (1839) and ROBERT HARE. *Subject Heading:* **1. Tornado theories.**—*W.N.*

10B–106 551.513.2:551.557:551.515.3

Lee, Jean T. and Galway, Joseph G. (*both, Severe Local Storms Forecast Center, Kansas City, Mo.*), **Preliminary report on the relationship between the jet at the 200-mb level and tornado occurrence.** *American Meteorological Society, Bulletin*, 37(7):327–332, Sept. **1956.** 9 figs., 7 refs. **DWB**—In a study of the 200 mb Height Chart and associated jet to determine their usefulness in tornado forecasting, a consistent phenomenon was observed, namely, that the majority of tornadoes investigated occurred along or near the −60°C isotherm at 200 mb. More precisely, the western and southern portions of the −60°C isotherm of the cold "pool" it circumscribed were the favored area. The jet at 200 mb in most cases delineated that portion of the −60°C isotherm under which tornadoes occurred. Further, certain consistencies appeared on the tropopause chart that might be related with tornado occurrence. (*Same item as* 8.4–183, April 1957, *MAB.*) *Subject Headings:* **1. Jet stream location 2. Tornado location.**—*Authors' abstract.*

10B–107 551.515.3/4:551.509.31:551.501.81

†§Ligda, Myron G. H., **Study of the synoptic application of weather radar data.** Texas. Agricultural and Mechanical College. Dept. of Oceanography and Meteorology. Contract AF 19(604)-573, Final Report, June **1956.** 103 p. 59 figs. (incl. photos), 9 tables, numerous refs., eqs. **DWB**—The main part of this unusually well edited and printed report deals with the storm of Sept. 29–30, 1954 in Oklahoma and Texas as analyzed by surface and 850, 700 and 500 mb synoptic reports and by radar. It is shown that many important features of the 12–48 hr development in such cases would be missed if the detailed picture of meso-scale structure provided by hourly radar photographs were not available. Other storms, and details of radar-climatology, severe storm warnings, limitations of equipment and methods used, and relation to lightning, pressure jump lines, hail, tornadoes, sferics, anomalous propagation, etc. are treated and illustrated. Abstracts of papers published under contract, personnel, travel, etc. are included in report. *Subject Headings:* **1. Radar synoptic analysis 2. Synoptic case history studies 3. Severe storm forecasting 4. Great Plains, U. S.** —*M.R.*

10B–108 551.515.3

Puckett, Pearl P., **The tornado, weather enemy No. 1.** *Flying*, N. Y., 58(3):26–27, 70–71, March **1956.** figs. **DWB**—A popular article on how tornadoes may be destroyed by guided missiles. F. O. ROSSMANN believes that the down-drafted stabilized tornado will disrupt and disintegrate by introduction of warm air. This, R. H. MAYER thinks can be accomplished successfully by shooting air-to-air missiles from jet planes into the "heart" of the tornado. Radars will be used for detection, prediction of path, and guidance to pilot. *Subject Heading:* **1. Tornadoes.**—*W.N.*

10B–109 551.515.3(749):551.509.31:551.501.81

Richards, William J. and Rosenberg, Louis, **Analysis of an east coast tornado situation.** *Weather Radar Conference, Sept. 1955, Proceedings of the Fifth . . . Conference*, p. 145–152, pub. **1956.** 5 figs. **DWB**—On April 8, 1954 Tuckerton, N. J., experienced a small tornado which meteorologically developed a cold front characterized by a sharp wind shift, strong temperature and dew point contrasts. Three weak echoes developed in the south-southwest area about 10 mi east of the main precipitation area and just outside the 50 mi range ring. This situation was followed by a steep pressure gradient. Four sectional surface maps are drawn, one for each hour. *Subject Headings:* **1. Radar echoes from tornadoes 2. Tornado analysis 3. Tuckerton, N. J.**—*N.N.*

10B–110 551.515.31:551.541

Tepper, Morris and Eggert, William E. (*both, U. S. W. B., Wash., D. C.*), **Tornado proximity traces.** *American Meteorological Society, Bulletin*, 37(4):152–159, April **1956.** 4 figs., table, 11 refs. **DWB, DLC**—Pressure, temperature, and relative humidity traces obtained from regular reporting and special network surface stations in operation in midwestern United States during the years 1951 through 1954 and located within 15 miles of a tornado are presented. It is noted from plots of the location of the stations with respect to the tornado that certain characteristics are suggested by the barograms, dependent primarily on the distance of the instrument from the tornado. Some relationships are also inferred between microcyclones and tornadoes, and between pressure jump lines and tornadoes. The available hygrothermograph traces show many instances of the drop in temperature and rise in relative humidity usually associated with the passage of a squall or pressure

ump line. Plot of the pressure fall *vs.* distance from the tornado suggests a $(\Delta p)^2 r$ =constant law or a "tornado-bearing microcyclone." Finally, a suggestion is made that some tornadoes may form as a result of some interaction between a pressure jump line and a microcyclone. (*Same item as* 3.3–168, March 1957, *MAB.*) *Subject Headings:* **1. Tornado structure 2. Pressure jump theory.**—*Authors' abstract.*

10B–111 551.509.52:551.515.3(764)

Texas. Executive Dept. Div. of Defense and Disaster Relief, **Tornado warnings for Texas schools.** [1956?] 1 leaf fold. **DWB**—A small leaflet giving in outline form the basic rules for schools to follow in minimizing the tornado hazard in a community. The warning service in effect in Texas is described and the part played by the U. S. W. B. and by other agencies—state and local—is reviewed. *Subject Headings:* **1. Tornado warning networks 2. Texas.**—*M.R.*

10B–112 551.509.52:551.515.3(781,778,766,764)

Tornado-like weather. *Science News Letter*, Wash., D. C., 69(21):325, May 26, **1956. DWB, DLC, DGL**—Pressure-jump warning equipment devised by U. S. W. B. for use in automatic network located in Kansas, Missouri, Oklahoma and Texas starting May 7, 1956, is described. Stations using the bell-device will be set up every 25–30 mi, and meteorologically equipped airplane reconnaissance planes will be used to supplement the network to avoid tornadoes slipping through the 200 mi spaces between regular U. S. W. B. stations. *Subject Headings:* **1. Pressure jump warning network 2. Great Plains, U. S.**—*M.R.*

10B–113 551.515.3/4

U. S. Weather Bureau, **Causes and characteristics of thunderstorms and other atmospheric disturbances.** 8th Interim Report submitted in accordance with Public Law 657, 80th Congress. Wash., D. C., July **1956.** 28 p. 27 foot-refs. **DWB** (M15.4 U587ia)—This report summarizes the basic problems and status of research projects being conducted by the U. S. W. B. in hurricane, tornado and severe storm research. The problem of tropical meteorology, the studies on development, movement, dissipation, wind and rainfall and storm surges in hurricanes, and the National Hurricane Research Project take up $\frac{2}{3}$ of the report. Recent conferences on hurricanes and on tornadoes, etc. are emphasized. *Subject Headings:* **1. Hurricane research projects 2. Tornado research projects.**—*M.R.*

10B–114 551.524.4:551.515.3

Ward, Neil B. (*U. S. W. B., Oklahoma City*), **Temperature inversion as a factor in formation of tornadoes.** *American Meteorological Society, Bulletin*, 37(4):145–151, April **1956.** 13 figs. (incl. photos), 5 refs. **DWB**—Experiments involving the observation of circular motion in a converging fluid largely confined between two horizontal surfaces, the lower surface representing the ground and the upper some restricting surface such as a temperature inversion, show that the formation, type, and intensity of a vortex funnel are dependent on the diameter of the exhaust area in the upper surface. Furthermore, it is possible that the diameter of a convective cell may be reduced by the action of subsidence about the cell. While Beebe (paper presented at 137th National Meeting of AMS, June 1955) has given extensive evidence indicating that an inversion does not exist in the general area where tornadoes occur, the author suggests that an inversion may form in a limited area in the immediate vicinity of a tornado after convection is in progress, through extreme depletion of air followed by subsidence, or by the falling of rain through layers with differing moisture contents. (*Same item as* 7F–216, June 1956, *MAB.*) *Subject Headings:* **1. Inversion effects on tornado formation 2. Tornado theories.**—*R. S. Quiroz.*

10B–115 551.509.32:551.515.3 551.509.32:551.515.4

§†Winston, Jay S., **Forecasting tornadoes and severe thunderstorms.** *U. S. Weather Bureau, Forecasting Guide*, No. 1, Sept. **1956.** 34 p. 42 figs., 55 refs. **DWB**—This review of the field of tornado forecasting includes a historic summary, data on the geographic, seasonal and diurnal distribution of tornadoes in the U. S. (1916–1955), discussion of parameters involved in tornado formation, forecasting methods, formulation of tornado forecasts, and an example of a forecast. Prediction of related phenomena, such as hail size and extreme turbulence, is also discussed. (*Same item as* 8C–37, March 1957, *MAB.*) *Subject Headings:* **1. Tornado forecasting 2. Thunderstorm forecasting.**—*G.T.*

1957

10B–116 551.509.52:551.515.3

American Meteorological Society (Council), **Announcement on detection, tracking and warning of tornadoes.** *American Meteorological Society, Bulletin*, 38(7):406–407, Sept. **1957. DWB**—

Forecasts of severe storms have improved to the point where positive forecasts of tornadoes can be expected to verify in some portion of the forecast area about 50% of the time (for 6–12 hrs in advance). However, these danger areas usually involve about 30,000 sq mi or more compared to the destruction area of 100 sq mi from a single storm. Hence the local forecaster must interpret these forecasts with a great deal more specificity and must issue warnings where needed, on the basis of sighted or radar detected trajectories of actual tornadoes. *Subject Headings:* **1. Tornado warnings 2. Tornado forecasting.**—*M.R.*

10B–117 551.515.31

Brooks, Edward M., **Quantitative models of wind velocity components in a tornado vortex.** St. Louis Univ. Institute of Technology, Contracts Cwb-8706 and Cwb-9229, Report No. 1, **1957.** 50 p. 2 figs., 2 tables, 13 refs., 51 eqs. **DWB**—In Pt. I of this paper several proposed vortex models are reviewed in historical sequence (REDFIELD, MACKINTOSH, FERREL, BIGELOW, BJERKNES, LITZMANN and WEGENER, ABDULLAH, TEPPER, REYNOLDS and LONG). In Pt. II, the author presents a detailed mathematical analysis of his own vortex model which differs from the earlier ones in that the vortex is not assumed to be in a steady state. With the help of this model, the cases of frictionless vortex of unlimited vortex, and of limited vortex with internal viscosity and with viscosity and surface friction are treated. *Subject Headings:* **1. Tornado models 2. Vortexes.**—*G.T.*

10B–118 551.590.21:551.515.3

Brooks, Edward M., **Study of some weather-sunspot correlations.** St. Louis Univ. Institute of Technology, Contracts Cwb-8706 and Cwb-9229, Report No. 2 (**1957?**). 12 p. fig., table, 10 refs. **DWB**—On the basis of data for the periods 1884–1915, 1916–1950, and 1884–1950, correlations between sunspots, temperature, precipitation and snowfall at St. Louis, tornado activity in the U. S. and random numbers (for control) have been computed and correlation coefficients (some significant at the 1% level) are tabulated. No significant correlation was found between sunspot number and tornado activity over the U. S. as a whole, although the positive and negative correlation coefficients for each state appear to show a systematic arrangement. *Subject Headings:* **1. Sunspot effects on temperature 2. Sunspot effects on precipitation 3. Sunspot effects on tornadoes.**—*G.T.*

10B–119 551.515.33

Brooks, Edward M., **Surveys of local windstorms in the St. Louis area.** St. Louis Univ. Inst. of Technology, Contracts Cwb-8706 and Cwb 9229, Report No. 5 (1957?). 10 p. 5 refs. **DWB** (M15.3 5145re)—Details concerning 13 dates with windstorms, 10 of which involved tornadoes, were ascertained by means of interviews based on an 11-point questionnaire. This paper contains a brief summary of information derived from the study in respect of synoptic development, pressure records, thunderstorm activity and precipitation attending the tornadoes, tornado paths and damage. A copy of the tornado questionnaire is included. *Subject Headings:* **1. Tornado statistics 2. Storm surveys.**—*G.T.*

10B–120 551.515.3(766,781)

Dickson, Don R., **Raw data report and [meteorological analysis of wind velocities of various tornadoes] (final report).** Oklahoma. Agricultural and Mechanical College. Research Foundation, Contract Cwb-9115. (Unnumbered report), Aug. **1957.** 193 p. numerous photos. Loose-leaf. Mimeo. **DWB** (M15.3 041ra)—A voluminous report consisting of ground and aerial photographs of tornado damage, and observer's analysis and eye witness reports of damage conditions, etc. during 5 tornadoes: 1) April 2, 1957 at Durant, Ardmore and Madill, Okla.; 2) April 22, 1957 at Kingfisher, Okla.; 3) April 25, 1957 at Holdenville, Okla.; 4) Cotton and Comanche counties, Okla., May 25, 1957 and 5) Kansas City, Mo., May 20, 1957. At end of report is an analysis of wind speeds of 3 tornadoes in relation to pressure differences on each side of a damaged structure. Winds were 160–175, >134.5, and 185 mph, respectively, and all were cyclonic with pressure differences up to 79 mb. (*Same item as* 9.5–15, May 1958, *MAB.*) *Subject Headings:* **1. Tornado damage surveys 2. Tornado winds and pressure 3. Tornado, Kansas City (May 1957) 4. Oklahoma 5. Kansas City, Mo.**—*M.R.*

10B–121 551.515.8:551.507.352

Fujita, Tetsuya, **Structure and movement of a dry front.** *American Meteorological Society Bulletin*, 39(11):574–582, Nov. **1958.** 10 figs. Also as Chicago. Univ. Dept. of Meteorology Contract Cwb-8950, Technical Report, No. 3, June **1957.** 9 p. 10 figs. Also included in the Final Report, Pt. 1, issued **1957. DWB** (M15 C532fi)—Aircraft observations taken in the course of three flights of the Tornado Research Airplane on June 11, 1956 were analyzed. The flights were made over the eastern slope of the Rocky Mountains where a squall line was predicted. The analysis revealed the structure of a dry frontal surface which played an important role upon the development

of the squall line. *Subject Headings:* **1. Tornado research airplane 2. Frontal analysis 3. Aircraft weather reconnaissance.**—*Author's abstract.*

10B–122 551.515.31

Gutman, L. N., **Teoreticheskaia model' smercha.** [Theoretical model of a tornado.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 1:79–93, **1957.** table, 11 refs., 67 eqs. **DLC.** Trans. into English by A. K. Henn in the English language edition of the **Izvestiia,** *Bulletin of the Academy of Sciences of the U.S.S.R., Geophysics Series*, No. 1:87–103, **1957,** issued 1957 by American Geophysical Union. 3 figs., 67 eqs. **DWB**—On the basis of a solution of the nonlinear system of equations of the thermodynamics of the atmosphere, the author develops an idealized model of a tornado as a process produced by the presence of large rotating movements and marked moisture instability in the atmosphere. From this model it is considered that the following conditions must be fulfilled in order that a tornado should develop: 1) the atmosphere should be unstable through thickness of 1–2 km; 2) intense storm activity with the formation of vortices with large movements of rotation should take place and 3) that either heat or impulse or kinetic energy sufficiently large to destroy unstable equilibrium should arrive at any point in the atmosphere. (*Same item as* 9.10–184, Oct. 1958, *MAB.*) *Subject Headings:* **1. Tornado models 2. Tornado dynamics.**—*I.L.D.*

10B–123 551.515.3(764)

Harrison, Malcolm C. (*MIC, U. S. W. B., Love Field, Dallas*), **Dallas tornado, April 2, 1957.** *Weatherwise*, Boston, 10(3):90–91, June **1957.** photo and explanation by Cliff Pope. **DWB**—The "most documented tornado on record," both by means of eye and photographic observation, occurred at Dallas, Tex., on April 2, 1957 at 4:30–4:50 p.m., passing about 1 mi southwest of the U. S. W. B. station at Love Field, and a mile or so from the heart of Dallas. A large photo shows the funnel approaching the center of the city, over the rooftops. It veered away to the north, however, and comparatively few casualties occurred. Details are recorded by the photographer (Cliff Pope) and the author. *Subject Headings:* **1. Tornado, Dallas (April 1957) 2. Tornado photographs 3. Dallas, Tex.**—*M.R.*

10B–124 551.501.81:551.515.3(764)

Hoecker, Walter H., Jr. (*U. S. W. B.*), **Abilene, Texas, area tornadoes and associated radar echoes of May 27, 1956.** *Weather Radar Conference, 6th, Cambridge, Mass., March* 26–28, 1957, *Proceedings*, pub. **1957.** p. 143–150. 7 figs., 7 refs. **DWB** (M01.81 R124pc)—A disturbance revealed as a single precipitation echo 85 mi northwest of Abilene, Tex., on the afternoon of May 27, 1956, developed into a relatively large thunderstorm group, is revealed via the radar scope presentation. It is possible to associate specific portions of the radar echoes with several of the tornadoes. For several hours the storm echoes moved to the right of the wind field in which they were apparently imbedded and for over an hour exhibited cyclonic motion. (*Same item as* 9H–38, Aug. 1958, *MAB.*) *Subject Headings:* **1. Radar tornado detection 2. Radar echoes from tornadoes 3. Tornado, Abilene, Tex. (May, 1956) 4. Abilene, Tex.**—*Author's abstract.*

10B–125 551.509.318:551.515.3

Kolobkhov, N. V., **Smerch pod Moskovoĭ.** [Tornado near Moscow.] *Meteorologiia i Gidrologiia*, Leningrad, No. 6:32–33, June **1957.** 2 figs. **DWB**—The synoptic conditions associated with the occurrence of a tornado on Aug. 25, 1956 at 1800 h are described. On that day severe thunderstorms, with storms south of Moscow associated with the passage of a deep cyclone which brought with it tropical southern air, brought about a tornado when the moist tropical air began to be replaced by cold maritime air from western parts of the U.S.S.R. The tornado arose at the cold front. An analogous synoptic condition accompanied the tornadoes in Kazan on Aug. 5, 1956. (*Same item as* 10.1-165, *MAB.*) *Subject Headings:* **1. Synoptic conditions for tornadoes 2. Tornado, Moscow (Aug. 1956) 3. Moscow, U.S.S.R.**—*I.L.D.*

10B–126 551.515.3:312.2

*†Linehan, Urban J., **Tornado deaths in the United States.** *U. S. Weather Bureau, Technical Paper*, No. 30, March **1957.** 48 p. 2 figs., 16 tables, 35 refs. (20 charts at end). **DWB.** Also: reprint from *Dissertation Abstracts*, Ann Arbor, Mich., 15(10), **1955.** (4 p.) Microfilm copy of complete manuscript of 491 p. available from University Microfilms, Ann Arbor, Mich. Price: $6.14. Enlargements 6″×8″, $.10 per page.—Data on tornado deaths and death days for all parts of the U. S. taken from U. S. W. B. for 38 yrs (1916–53) are analyzed and the analyses presented in tables, graphs, maps, etc. and discussed in the text with respect to hourly, monthly, annual and regional variations. Separate maps of U. S. show by dates the deaths during each month. Seasonal shifts in regions of greatest danger are also shown on maps. March–June accounts for $\frac{4}{5}$ of the 8700 deaths and March–April for 53%. 60% of deaths occurred in first half of 38 years; 40% in last half,

and 3 out of 4 occurred between 1:30 p.m. and 9:30 p.m. Population factors are considered throughout. (*Same item as* 9.9–27, Sept. 1958, *MAB.*) *Subject Headings:* **1. Tornado deaths 2. United States.**—*M.R.*

10B–127 551.515.3(73/9) 551.577.37

Ludlum, David M., **Tornadoes mark May, and a hurricane visits in June.** *Weatherwise*, Boston, 10(4):134–138, Aug. **1957.** figs. (8 maps). **DWB**—Drought was broken in March and further ameliorated in the southern plains by flood-producing rains, accompanied by hail and tornadoes in the wettest May on record (in Texas and vicinity to northeast). Also greatest number of tornadoes of any month on record. *Subject Headings:* **1. Tornado frequencies 2. Record rainfall 3. United States.**—*M.R.*

10B–128 551.515.3(437)

Mendel, Gregor, **Die Windhose vom 13. October 1870.** [The tornado of the Oct. 13, 1870.] *Naturforschender Verein, Brünn, Verhandlungen*, 9:229–246, **1870. DLC.** Trans. by E. J. Weiss, M. Tepper and J. Kuettner, Washington, **1957.** 23 p. **DWB** (M15.3 M5372to)—Details of the passage of a tornado over Brünn (Brno), estimated size and velocity, and the damage caused are discussed. The author notes that the tornado's rotation was clockwise, contrary to what might be expected by analogy with tropical cyclone rotation. An interpretation of tornado formation is attempted on the basis of the penetration of a fast-moving upper air mass into a surface air mass moving in a different direction. Various physical properties of tornadoes appear to be consistent with this hypothesis. *Subject Headings:* **1. Tornadoes 2. Tornado theories 3. Brno, Czechoslovakia. I. Weiss, E. J.** (*trans.*) **II. Tepper, M.** (*trans.*) **III. Kuettner, J.** (*trans.*)—*G.T.*

10B–129 551.515.327

Murino, Clifford John, **Upper tropospheric conditions during surface tornadic activity.** St. Louis Univ. Institute of Technology, Contracts Cwb-8706 and Cwb-9229, Report No. 4, **(1957?).** 58 p. 37 figs., 8 refs. **DWB** (M15.3 5145re)—Upper level conditions attending the severe storm activity of April 1–4, 1956 are analyzed by means of 500 mb and tropopause data and vertical cross sections. A close relationship is found to exist between the portion of the tropopause ridge lines and the surface squall line. Also "the development of a tropopause configuration having a complex network of minor ridge and trough lines superimposed upon the primary pressure distribution will precede by 36 hrs the occurrence of tornadoes, provided the low-level requirements regarding moisture distribution and instability are met." *Subject Headings:* **1. Tornado analysis 2. Synoptic conditions for tornadoes.**—*G.T.*

10B–130 551.515.31

Pate, Floyd C., **Windstorms and tornadoes in Alabama and the Southeast.** Montgomery, Ala., W. B. Airport Station, March 11, **1957.** 16 p. 8 figs., 6 refs. **DWB**—On the basis of much personal experience and somewhat limited statistics, the writer suggests that tornadoes probably do not occur in a given locality in Alabama when conditions favor severe straight winds, unless the prevailing straight winds are generally nearly strong enough to be damaging. For tornadoes to occur, thunderstorm overturning must be mainly at high levels so that no down drafts reach low levels to interfere with tornado formation. Increasing winds with height are considered to be the means of producing the majority of tornado airmasses when upstream temperature and moisture gradients are favorable. An experiment with water illustrates how this wind system could possibly furnish the impulse which causes a tornado to develop from the side of a thunderstorm. Due to the absence of strong low-level convection, the energy of a tornado comes from heat of condensation as air moves into the whirl and is lowered in pressure without being lifted. A resulting hypothesis is given to account for the strict limitation of the diameter of a tornado. (*Same item as* 9.8–172, Aug. 1958, *MAB.*) *Subject Heading:* **1. Tornado formation.**—*Author's abstract.*

10B–131 551.515.3(472)

Peryshkin, I. N., **Smerch v Belorussii.** [Tornado in Byelorussia.] *Meteorologiia i Gidrologiia*, Leningrad, No. 5:29–30, May **1957.** figs. **DWB**—A detailed description with the aid of photographs of the cause and damage of the tornado which occurred on Aug. 18, 1956 about 1800 o'clock in the Chervensk and Berezinsk districts in Minsk Oblast. The rotation of the funnel proceeded counterclockwise and the velocity of the tornado was 10 m/sec. *Subject Headings:* **1. Tornadoes 2. Minsk Oblast, U.S.S.R.**—*I.L.D.*

10B–132 551.515.3(773):551.556.1

*Reynolds, George W. (*Eng. Res. Inst., Univ. of Mich.*), **A common wind damage pattern in relation to the classical tornado.** *American Meteorological Society, Bulletin*, 38(1, Pt. 1):1–5, Jan. **1957.** 3 figs., 4 tables, 16 refs. **DWB, DLC**—If a tornado is moving rapidly there may be no

damage done by winds blowing toward the approaching center, as the forces may balance. This was evidently the case with 3 major tornadoes investigated by the author (Vicksburg, Waco and Wood River, Ill., tornadoes of Dec. 1953, May 1953 and May 1949, respectively, with a total of 157 deaths) and 6 less important tornadoes. The damage usually builds up rapidly from right to left and then suddenly drops off to zero. Wind speed–pressure relationships are worked out theoretically and the effects of translation on total wind pressure calculated. Tables give resultants for different speeds of rotation and translation, for right and left side of path and force on a 36′×10′ wall for various wind speeds. (*Same item as* 9.4–135, April 1958, *MAB.*) *Subject Headings:* **1. Tornado damage patterns 2. Illinois.**—*M.R.*

10B–133 551.501.81:551.515.3

Schuetz, John and Stout, Glenn E., **RHI radar observation of a tornado.** *American Meteorological Society, Bulletin*, 38(10):591–595, Dec. **1957.** 7 figs., 4 refs. **DWB, DLC**—Preceding the development of a tornado at the ground a fingerline projection developed on the PPI in the S.W. corner of an echo. This was also visible on the three-dimensional models constructed from RHI data. The parent echo extended to 37,500 ft and was the highest echo in the vicinity. Tornado occurrence was simultaneous with a new cell merging with the finger. Photographs of the tornado, the lower level echo tilt, and winds aloft data all indicate the same direction of shear. *Subject Headings:* **1. Radar observation of tornadoes 2. Radar tornado detection.**—*Authors' abstract.*

10B–134 551.515.3/4:551.509.52

Stinson, J. Robert, **Surface θ_E chart and surface $(\theta_E - \theta)$ index in severe local storm forecasting.** St. Louis Univ. Institute of Technology, Contracts Cwb-8706 and Cwb-9229, Report No. 3, (1957?). 10 p. 15 figs., 5 refs. **DWB**—Current techniques for forecasting precipitation and severe local storms have become increasingly dependent on upper air data and analysis. These procedures are limited by the frequency and spacing of upper air observations. A surface θ_E chart including a $(\theta_E - \theta)$ instability index can be used to supplement current procedures. The surface θ_E chart has the distinct advantage of being available on an hourly basis. The elements analyzed on the surface θ_E chart include θ_E $(\theta_E - \theta)$ and wind field. An analysis example for the period beginning at 2130 CST on Feb. 24 through 0230 CST on Feb. 25, 1956 is presented to illustrate the analysis and its interpretation. *Subject Heading:* **1. Severe storm forecasting.**—*Author's abstract.*

10B–135 551.515.3:551.509.31

†Stinson, J. Robert, **The Waco tornado of May 11, 1953.** St. Louis Univ., Inst. of Technology, Contracts Cwb-8706 and Cwb-9229, Report No. 6, (1957?). 80 p. 37 figs., table, 30 refs. **DWB** (M15.3 5145re)—An extensive surface and upper-air analysis (with emphasis on the latter) is made of a 48-hr period (May 10–12, 1953) during which two tornadoes occurred in the San Angelo and Waco, Texas areas. Tropopause charts, constant pressure charts for 17 levels up to 350 mb, vertical cross sections and time sections were prepared and are presented and discussed. In addition to confirming the five conditions determined by Fawbush and Miller (1953) (*see* 5.5–67, May 1954, *MAB*) as being necessary and sufficient for tornado formation, the study reveals the existence of a depression of the tropopause separated by a tropopause ridge from the primary tropopause low. Such tropopause depressions were successfully used by the author for tornado forecasting. Furthermore a narrow low-level moisture wedge characterized by strong isodrosotherm gradients on both sides of its axis is described, believed to be one of the earliest indicators of possible severe weather development. The author does not believe, however, that an analysis of the type reported in this paper could be undertaken as routine forecasting procedure and therefore recommends the use of 3 types of charts for tornado forecasting centers. The study includes a review of earlier literature on tornado analysis. *Subject Headings:* **1. Tornado, Waco, Tex. (May 1953) 2. Synoptic conditions for tornadoes.**—*G.T.*

10B–136 551.515.33(73/9)

*Tepper, Morris (*U. S. W. B., Wash., D. C.*), **On the evaluation of tornado reports and a numerical method for their classification.** *Monthly Weather Review*, Wash., D. C., 85(5):159–165, May **1957.** 4 figs., 4 tables. **DWB**—Tornado statistics and reports from the U. S. for the period 1916–1956 are examined critically in the light of the evident "explosive" increase in the number of tornadoes since 1948. The tornado deaths for the same period of years do not bear out this increase since 1948. Hence it is supposed that more accurate and detailed reporting of tornadoes, or even reporting of many small funnel clouds or severe storms that would not have been reported previously is responsible. This began with the establishment of SELS and other tornado observing and forecasting networks. A method of reducing this bias so that recent statistics are comparable with earlier data is outlined and illustrated. (*Same item as* 9.10–185, Oct. 1958, *MAB.*) *Subject Headings:* **1. Tornado statistics 2. Tornado report homogeneity 3. United States.**—*M.R.*

10B–137 551.515.3/4:551.501.81

§Texas. Agricultural and Mechanical College. Dept. of Oceanography and Meteorology, **Middle-latitude precipitation patterns as observed by radar (a collection of composite radarscope observations).** Contract AF 19(604)-1564, Scientific Report No. 1, Jan. **1957.** unpaged. numerous figs.—A series of 22 storms occurring in the midwest from Sept. 1954 through June 1955, are analyzed and the results presented in the form of composite hourly radar photographs superimposed on maps of the southern Mississippi Valley and Great Plains, plus synoptic surface charts for every 3 hrs and a brief discussion of each storm or situation involved. The purpose of the atlas is to show the type of echo attending the various types of severe storms, tornadoes, hailstorms, line squalls, flood producing cloudburst, etc. The atlas is looseleaf so it can be supplemented. *Subject Headings:* **1. Radar storm photographs 2. Severe storm analysis.**—*M.R.*

10B–138 551.509.52:551.515.3(02)

U. S. Air Weather Service, **Severe weather forecasting.** Its *AWS Manual* 105-37, May 1, **1957.** 147 p. 82 figs., 13 tables. **DWB** (M(055) U58am)—In this manual the general methods and procedures used by the Air Weather Service Severe Weather Warning Center in forecasting severe local storms (tornadoes, severe thunderstorms, hail and turbulence aloft) are outlined for the purpose of guidance in the use of severe weather forecasts on a local basis. In the section on tornadoes (p. 3–54), tornado-producing air structures, chart construction and analysis procedures, the maximum potential instability chart, squall line development, synoptic patterns favorable for severe weather, and the height-of-wet-bulb-zero criterion are discussed and an example of a tornado forecast is given. The other types of severe weather forecasts are treated in a similar manner. The appendices include a glossary, tornado statistics for the United States (1916–1955), etc. This edition of the manual supersedes the much less extensive 1952 edition (7F–167, June 1956 and 8C–31, March 1957, *MAB*). *Subject Headings:* **1. Tornado forecasting 2. Severe storm forecasting 3. Forecasters manuals.**—*G.T.*

10B–139 551.501.7:551.507.352:551.515.3

Van Thullenar, C. F. (*Chief, District Meteorologist, U. S. W. B., Kansas City, Mo.*), **The tornado research airplane.** *Weatherwise*, Boston, 10(3):82–84, 104, June **1957.** 3 figs. (incl. photo). **DWB**—An F-51 research airplane equipped to measure vertical distribution of pressure, temperature, humidity, etc. in association with severe squalls (that might develop into tornadoes), rather than merely observing funnel clouds was owned and operated by JIM COOK under contract with U. S. W. B. based at Dallas, Texas, in 1956 and 1957. Vertical motions preceding squalls and cooling resulting from precipitation, which also affects development and progress of squalls are studied from photographic and instrumental observations made by this plane for U. S. Air Weather Service and U. S. W. B. Schematic flight plans to get maximum information from squall area during its formation, is described and illustrated. (*Same item as* 9.9-106, Sept. 1958, *MAB.*) *Subject Headings:* **1. Tornado research airplanes 2. Aircraft weather reconnaissance 3. Severe squall research 4. Dallas, Tex.**—*M.R.*

10B–140 551.509.52:551.515.3

§Whiting, R. M. and Bailey, R. E. (*both, Eastern Airlines Inc., Atlanta*), **Some meteorological relationships in the prediction of tornadoes.** *Monthly Weather Review*, Wash., D. C., 85(5):141–150, May **1957.** 18 figs., 5 tables, 8 refs. **DWB**—An objective forecasting study of surface and upper level synoptic conditions in relation to tornado occurrence using Jan.–June data for the southern Midwest and Plains for 1950 through 1954 as dependent data, and 1955 for independent data. Polar charts show that in Jan., Feb. and March most tornadoes occur in a 450 mi radius of the center of a cyclone and in the S.E. quadrant. In April, May and June they occur more often in the N.E. quadrant. Their relationships with pressure, surface dew point, stability, 850 and 700 mb patterns, 500 and 200 mb conditions, etc. are given. A list of 8 criteria is established and tests made on Jan.–June 1955 maps to see how well these criteria outline the tornado areas. Most cases of multiple tornadoes were correctly placed—a number of isolated tornadoes were missed and on a few of the days forecast none occurred. (*Same item as* 9.8–140, Aug. 1958, *MAB.*) *Subject Headings:* **1. Objective tornado forecasting 2. Tornado forecasting 3. Great Plains, U. S.**—*M.R.*

10B–141 551.509.318:551.515.3

Whiting, R. M. (*Eastern Airlines, Atlanta, Ga.*), **The surface chart as a synoptic aid to tornado forecasting.** *American Meteorological Society, Bulletin*, 38(6):353–356, June **1957.** 4 figs., 4 refs. **DWB, DLC**—An attempt is made to relate the occurrence and the location of tornado activity to areas of intense surface warm advection as indicated by the isobars and isotherms on the sea level chart. The degree of cross-isotherm flow is classified by the packing of the thermal field and the temperatures in it along with the strength and direction of flow as indicated by the isobars to determine short range forecasting patterns. The method presented is limited in that it is not applicable

) all tornado situations and is offered as a supplementary technique which could serve to raise the onfidence level of short range tornado forecasts based on upper air parameters. (*Same item as* .10–110, Oct. 1957, *MAB.*) *Subject Headings:* **1. Synoptic conditions for tornadoes 2. Tornado orecasting 3. Surface charts.**—*Author's abstract.*

10B–142 551.515.33:551.501.81(781,778)

Williams, D. T. and Hanks, Howard H., Jr. (*both, SELS Center, U. S. W. B., Kansas City, Mo.*), **The path of the Kansas-Missouri tornado of May 20, 1957.** *Monthly Weather Review*, Wash., D. C., 5(6):205–206, June **1957.** fig., 2 tables. **DWB, DLC.** Also: Garrett, Richard A. and Rice, Ralph T. (*both, W. B. Airport Sta., Topeka, Kans.*), **Some radar aspects of the May 20, 1957, Kansas-Missouri tornado.** *Ibid.*, Wash., D. C., 85(6):206–207, June **1957.** fig. **DWB, DLC**—The most ramatic of the many tornadoes that occurred on May 20, 1957 in Kansas, Nebraska and Oklahoma nd Missouri was the Kansas-Missouri tornado that killed over 40 and injured about 200 people, nd caused millions of dollars of property damage—mainly in suburban Kansas City. A chart hows in detail the course, path width, times of passage and unusual features. The path was 71 ni long with only 7 mi of dual path and almost no skipping. Width varied from 1/10 to 4/10 mi see Table 1). No relation was found between path or path width and topography. In the second rticle, sketches show anvil shaped radar echo (RHI-scope) as observed on Topeka, Kans. weather adar from 1800–1810 CST. An appendage was noted shortly after 1808 and it reached the ground bout the time the tornado first struck. The appendage persisted for about 90 min. while the main nvil shrank in size. *Subject Headings:* **1. Tornado, Kansas-Missouri (May 20, 1957) 2. Tornado racks 3. Radar tornado tracking 4. Kansas 5. Missouri.**—*M.R.*

1958

10B–143 551.515.8:551.511:551.507.352

Beebe, Robert G. (*U. S. W. B., Kansas City, Mo.*), **An instability line development is observed y the tornado research airplane.** *Journal of Meteorology*, Boston, 15(3):278–282, June **1958.** 1 figs., 2 refs. **DWB, DLC**—A case study of the formation of an instability line traversed by the ornado research airplane before, during and after development is presented. Five traverses at the 00 mb level and two traverses at the 700 mb level were flown normal to the line. Gradients of noisture and temperature and their changes in time and space as shown from the aircraft data are resented. The dew-point front at the 800 mb level was traversed in a distance of one mile and as observed on all 800 mb traverses. The instability line developed immediately ahead of this ront. *Subject Headings:* **1. Tornado research airplanes 2. Instability line 3. Aircraft weather econnaissance.**—*Author's abstract.*

10B–144 551.515.3:551.508.822

Beebe, Robert G., **Tornado proximity soundings.** *American Meteorological Society, Bulletin*, 9(4):195–201, April **1958.** 10 figs., table, 6 refs. **DWB, DLC**—Twenty four radiosoundings near r ahead of tornadoes (within 50 mi or 1 hr, or in same air mass) in the Midwest were studied revealing nat the typical inversion is destroyed in the immediate vicinity of the tornado, and the moist layers ncrease tremendously (e.g., from 2700 ft to 13,000 ft) in depth just ahead of the tornado, and de- rease in the area far upstream and in other directions. Around the tornado area, a distinction is nade between precedent and proximity soundings. Several soundings on Feb. 19 and 20, 1951 t Oklahoma City, Ft. Worth, San Antonio and Brownsville show changes in 12 hrs (before and after ornado), also depth of moist layer and Showalter Stability Index for 11 cases, and post tornado ounding. *Subject Headings:* **1. Tornado proximity soundings 2. Great Plains, U. S.**—*M.R.*

10B–145 551.515.3(73/9)

Beebe, Robert G. (*Severe Local Storm Warning Center, U. S. W. B., Kansas City, Mo.*), **Tornadoes uring 1955.** *Weatherwise*, Boston, 9(1):18–21, Feb. **1956.** photo, map. Also his: **Tornadoes and ornado research in 1956.** *Ibid.*, 10(1):14–17, 34, Feb. **1957.** 2 figs., 2 refs. Also his: **Tornadoes uring 1957.** *Ibid.*, 11(1):13–15, 37–38, Feb. **1958.** 2 photos, 4 refs. **DWB, DLC**—More tornadoes ere reported in 1955 (about 900) than in any previous year. Map of the U. S. shows location of nch and direction of movement of several. One hundred and fifty lives were lost and property amage was $50 million. The worst was the Blackwell-Udall storm in Oklahoma and Kansas, n May 25, with 102 lives lost and 600 injured. At Scottsbluff, Nebr., on June 27, 12 tornadoes were bserved and 110 photographs (35 in color) and 10 color movies obtained. In 1956 the number of ornadoes reported (about 850) was near the record number of 1955. Map of locations and paths is resented. Programs aimed at reducing tornado damage (especially the use of radar) are mentioned nd found to show promising results. In 1957 over 1600 tornadoes and funnel clouds were reported 961 actual tornadoes shown on map of U. S.), setting a new record. Unusually marked convective ction prevailed in 1957. A wet spring in the Southern Plains as well as the increased efficiency of

reporting accounted for the record number. About 154 lives were lost in 14 different situations. Details are recounted, excellent movie photos of a building being destroyed (enabling calculation of speeds of debris elements) reproduced, effectiveness of warning and forecast service in 1957 (Dallas, Kansas City and Fargo) and research problems discussed. Results of 3 separate investigations showed wind speeds of 150–160 mph as the highest occurring when extensive damage prevailed. *Subject Headings:* **1. Tornadoes, United States (1955–1957) 2. Tornado wind speeds 3. Tornado research 4. United States.**—*M.R.*

10B–146 551.515.3:551.509.52

Darkow, G. L.; Suomi, V. E. and Kuhn, P. M., **Surface thermal patterns as a tornado forecast aid.** *American Meteorological Society, Bulletin*, 39(10):532–537, Oct. **1958.** 3 figs., table, 3 refs. **DWB**—The forecast tool suggested in this paper is based on the finding that thermal tongues averaging 50 mi or less in width are favored locations for tornado activity. Such tongues can be readily located on surface synoptic charts. Results of an operational test of the suggested forecast procedure are presented and evaluated. It is believed that the method deserves consideration as an additional severe-storm forecasting tool which, if adopted, would require only 15–20 min additional analysis time. *Subject Heading:* **1. Tornado forecasting.**—*G.T.*

10B–147 551.515.31(773)

§Fujita, Tetsuya (Chicago Univ.), **Mesoanalysis of the Illinois tornadoes of April 9, 1953.** *Journal of Meteorology*, Boston, 15(3):288–296, June **1958.** 22 figs., table, 7 refs. Also issued as: Chicago Univ. Dept. of Meteorology, Contract Cwb 8613, Technical Report (Unnumbered), Nov. **1956.** 18 p. 28 figs., 6 refs. This is bound in its **Report** (unnumbered), Aug. 1, 1955–June 30, 1956. Issued Feb. **1957. DWB**—The original radar film of the Illinois tornadoes was analyzed with the additional use of surface observations from the available stations in the vicinity. This study shows that the tornadoes were associated with a tornado cyclone resembling a miniature hurricane in many respects. The tornado cyclone was only 30 mi in diameter, and it was characterized by an eye at its center, spiral echo bands, etc. The echo movement inside the tornado cyclone indicates that air converged at low levels then rose following the boundary of the eye. The location of the Champaign tornado with respect to the tornado cyclone center was carefully examined; it was placed beneath the ring of maximum wind, south of the cyclone center. Such a relative position was maintained at least during the developing stage of the tornado. It was found that the direction of movement of the tornado cyclone formed a 25° angle with that of the echoes in outer fields. (*Same item as* 9.2–200, Feb. 1958, *MAB.*) *Subject Headings:* **1. Mesoanalysis of tornadoes 2. Tornado, Urbana, Ill. (April 1953) 3. Tornado dynamics 4. Illinois.**—*Author's abstract.*

10B–148 551.515.3:551.509.52

Kuhn, Peter M. (*U. S. W. B., Office of Met. Res.*); Darkow, G. L. and Suomi, V. E. (*both, Wisc. Univ. Dept. of Met.*), **A mesoscale investigation of pre-tornado thermal environments.** *American Meteorological Society, Bulletin*, 39(4):224–228, April **1958.** 7 figs., 2 refs. **DWB**—The climatological network of Kansas is found to be dense enough for a mesoscale analysis of thermal conditions. Such an analysis is undertaken in this paper in connection with 252 tornadoes which occurred in 1951–1955 in Kansas and Oklahoma. A marked correlation is found between locations of tornado occurrence and maximum temperature fields. On the basis of this correlation a short-range forecasting technique is proposed, utilizing thermal patterns as seen in thermal composite charts. Preliminary testing of the method, which included 57 tornado occurrences in six states, appears to show promising results, with 72% of the tornadoes within the forecast areas. *Subject Headings:* **1. Mesoanalysis of tornadoes 2. Tornado forecasting.**—*G.T.*

10B–149 551.557.5:551.509.52:551.515.3

Lee, Jean T. and Galway, Joseph G. (*both, U. S. W. B., SELS Center, Kansas City, Mo.*), **The jet chart.** *American Meteorological Society, Bulletin*, 39(4):217–223, April **1958.** 8 figs., 10 refs. **DWB, DLC**—In a previous paper (5) the authors have indicated the observed relationship between the jet at 200 mb, the −60C isotherm at 200 mb and tornado occurrences. The location of this jet has become important in severe local storm forecasting procedures. Often, the lack of a band of strong winds at 500 mb, especially during the summer months, made this level ineffective as an aid in locating the jet some height above. The 200-mb data are not transmitted until more than six hours after time of observation; thus, the formulation of a chart which is not a constant-pressure chart and called by SELS "The Jet Chart" was conceived to remedy this situation. The preparation, analysis, and use of this chart in severe local weather forecasting are set forth here. *Subject Headings:* **1. Jet chart 2. Jet stream effects on tornadoes 3. Tornado forecasting.**—*Authors' abstract.*

10B–150 551.515.33(73/9)

Lee, Jean T. (*U. S. W. B., Kansas City, Mo.*), **Tornadoes in the United States, 1950–1956.** *Monthly Weather Review*, Wash., D. C., 86(6):219–228, June **1958.** 20 figs., ref. **DWB, DLC**—In an arrangement similar to that of an earlier report which covered the period 1916–1950 (U. S. Weather Bureau, 1952, *see* 10B–29), tornado statistics for the United States are presented for the period 1950–1956. An average of 458 tornadoes per year were observed during this period, as opposed to 149 per year during the earlier period. A map showing tornado frequencies over the U. S. and graphs showing annual and diurnal variations by states, are included. *Subject Heading:* **1. Tornado statistics, U. S. (1950–1956).**—*G.T.*

10B–151 551.515.3

Mercier, Pierre and Wacker, Pierre, **La trombe du 7 octobre 1956 sur le lac Lêman.** [Waterspout over the Lake of Geneva on Oct. 7, 1956.] *Société Vaudoise des Sciences Naturelles, Lausanne, Bulletin*, 67(297):11–17, July 25, **1958.** 2 figs., 4 photos. **DWB**—Development of the waterspout and attendant weather phenomena (including upper-air soundings) are discussed in detail and photographs presented (showing that waterspouts are transparent). Various theories of waterspout formation are reviewed. *Subject Headings:* **1. Waterspouts 2. Lake of Geneva, Switzerland.**—*G.T.*

10B–152 551.515.3

Miller, James E., **Tornadoes.** (In: N. Y. Univ. College of Engineering. Research Div. Dept. of Meteorology and Oceanography, Contract AF 19(604):1387, Final report, June **1958.** p. 54–78. 6 figs., 3 tables, 5 refs., 43 eqs.) **DWB** (M15 N532s)—The effect of differential advection in tornado situations is shown by an analysis of tornado composite charts. The processes occurring during the incipient stage of a tornado are explored, and some speculations are made concerning the mechanism that withdraws air from the tornado. Two mathematical models are reviewed. Observations on a physical model are used to derive an idealized theory of the steady state. The idealized theory is applied to other rotary storms with some degree of success. *Subject Headings:* **1. Tornado models 2. Tornado theories.**—*Author's abstract.*

10B–153 551.576.1:551.515.3(545.8):551.509.31

§Rao, D. Venkateswara and Sen, Bijay Bhusan (*both, Civil Aviation Training Center, Allahabad*), **On a destructive pendant cloud at Bamrauli.** *Indian Journal of Meteorology and Geophysics*, New Delhi, 9(1):41–46, Jan. **1958.** 8 figs. (incl. photos), 4 refs. **DWB, DLC**—An analysis of the synoptic conditions attendant upon the passage of a balloon-shaped pendant cloud with a thunderstorm at Bamrauli at 1255 IST on Sept. 19, 1956 and nature of the meteorological changes and destruction caused by it indicate that the cloud was identical with a tornado in which the pendant failed to reach the surface. It is shown that conditions favorable for the appearance of tornadoes or tornado clouds are present in India and develop about noon at discontinuities of the cold front type in pre-monsoon and post-monsoon seasons. An analysis of the synoptic situation and of the autographic records of the rainfall, pressure, temperature and relative humidity (Sept. 13, 14 and 15, 1956) is presented with the aid of synoptic chart, tephigram and graphs. A map showing the track of the tornado and photographs of the damage are shown. *Subject Headings:* **1. Tornado analysis 2. Synoptic conditions for tornadoes 3. Tornado clouds 4. Bamrauli, India.**—*I.L.D.*

10B–154 551.515.3:69

Reynolds, George W. (*Univ. of Michigan*), **Tornadoes and how to handle them.** *Consulting Engineer*, N. Y., Vol. 10, May **1958** (8 p.) 5 figs., photos. Abstracted from reprint. **DWB, DLC**—Winds of 300–700 mph and pressure reduction of ½ atmosphere in tornadoes are believed to be exaggerated, since winds of 150–200 mph and pressure reduction of only 1″ of mercury in an unvented building could account for extreme damage often observed. The nature of the forces operating and the remedies, such as bolting or anchoring building to foundation and roof to building, are elaborated on. Examples are cited where brick buildings with additional loads on roof collapsed and other (frame or reinforced steel or concrete) buildings did not; where venting saved a building and where, if the roof stays on, the whole building is spared from damage. (For further details, *see* 10.2–206, this issue.) *Subject Headings:* **1. Tornado damage prevention 2. Tornado resistant construction.**—*M.R.*

10B–155 551.509.52:551.515.3

§Sądowski, Alexander (*U. S. W. B., Wash., D. C.*), **Forecasting tornado possibilities.** *Weatherwise*, Boston, 11(2):51–54, April **1958.** 7 figs. **DWB, DLC**—Steps followed by the tornado forecaster at the U. S. W. B. Severe Local Storm Forecast Center at Kansas City in determining the danger area and the degree of tornado hazard, as exemplified by the situation on May 20, 1957 (0630 CST), are outlined and illustrated by surface, 850 and 500 mb charts and prognostic com-

posite chart of tornado potential factors, and by tornado occurrence forecast areas for Nebraska, Kansas, Iowa and Western Missouri (with verification points) as issued at 11 h and extended at 15-16 h CST. The problem is to keep the area as small as possible, yet to include all dangerous tornado activity. *Subject Headings:* **1. Tornado forecasting procedures 2. Severe Local Storm Forecasting Center 3. Kansas City area.**—*M.R.*

10B–156 551.509.31:551.501.81

Texas. Agricultural and Mechanical College. Dept. of Oceanography and Meteorology, **Synoptic analysis and forecasting applications of radar weather observations.** Report prepared by the Project Staff. Contract AF 19(604)-1564, Final Report, June **1958.** 123 p. numerous figs., refs. Abstracts of papers prepared under the project, p. 104–111. **DWB**—In continuation of work initiated under contract AF 19(604)-573 (**Study of the Synoptic Application of Weather Radar Data**), many aspects of operational radar meteorology have been explored and are reported and illustrated in this paper. Most promising preliminary results have been obtained in the use of radar observations in intermediate range (12–48 hr) forecasting. By application of a new analytical technique it appears that such elements of weather forecasting as time and place of precipitation outbreak, squall line formation, high, middle, and low cloud advection and formation, and allied questions can be determined with much higher precision and confidence than is possible at present. Considerable attention was focused on problems of storm structure. Nocturnal thunderstorms, squall lines, and isolated tornado thunderstorms are all considered and some interesting findings obtained. Perhaps the most important (but least spectacular) contribution of radar observations to these investigations was the initial selection of storms to be examined. Such capability to select and identify reasonable numbers of basically similar systems has seldom before been realized by students of severe storms, except perhaps in the case of tropical cyclones. In the area of local utilization of radar storm observations, the questions of severe storm observation and warning, flood forecasting, local forecasting studies, and radar climatology are considered. A very extensive and ambitious film collection program was undertaken (a radar film inventory is included). *Subject Headings:* **1. Radar synoptic analysis. I. Ligda, Myron G. H.**—*From author's abstract.*

10B–157 551.515.3(776)

U. S. Naval Air Station, Minneapolis. Aerological Office, **Tornado occurrences in Minesota. 1958.** 3 p. 3 tables (1 fold.), 2 refs. Prepared in cooperation with the State Climatologist Weather Bureau Office, Minneapolis, Minn., for the period 1916–1954. Mimeo. **DWB** (M15.3 U585to)—Minnesota tornado statistics are summarized for the period 1916–1954. The average length of tornadoes was 25 mi although many tornadoes were from 1 to 10 mi. The greatest length recorded was 150 mi. The average width was 318 yds. Relative distribution of the tornadoes, lives lost, property damage as well as the frequency and time of occurrence of the tornadoes are discussed and summarized. *Subject Headings:* **1. Tornado statistics, Minnesota 2. Minnesota.**—*N.N.*

10B–158 551.515.3(73/9):551.509.52

U. S. Weather Bureau, **Severe weather forecasts: their importance to the pilot.** On reverse of its *Daily Weather Map*, March 7, **1956** (also its *Aviation Series* No. 7). photos. Idem, **Tornado forecasts and weather charts.** *Ibid.*, Feb. 6, **1958.** 7 figs. Idem, **Local storm warning networks.** *Ibid.*, March 5, **1958.** photos. Idem, **Tornadoes.** *Ibid.*, April 25, **1958.** charts, photos. Idem, **Notes on severe local storm warning networks.** Its *L.S.* 5602, Jan. 16, **1956. DWB**—These weather map backs present illustrated information concerning the nature of tornadoes and other severe storms, their frequencies in the U. S., damage caused by them, details of the forecast and warning procedures at the SELS Forecast Center at Kansas City, suggestions for organizing local storm warning networks, for building storm cellars, etc. Similar information is contained in the *L.S.* 5602 sheet. *Subject Headings:* **1. Severe storm warning 2. Tornado forecasting 3. Tornado statistics, United States (1916–1957).**—*G.T.*

10B–159 551.515.3(778

U. S. Weather Bureau, **Tornadoes in Missouri, 1957.** Prepared by State Climatologist U. S. W. B., Columbia, Missouri, Jan. 13, **1958.** 4 p. tables. **DWB** (M15.3 U587tmo)—During 1957, 29 tornadoes touched the ground and 42 funnels were reported aloft in Missouri. At least 55 deaths and 633 injuries were reported, and millions of dollars of property damage. Data for each month of each year, 1951–1957 are tabulated. Previous occurrences (e.g., in 1927) are mentioned and numbers of tornadoes and deaths each year since 1916 tabulated. Each tornado and each funnel cloud reported in 1957 is cataloged as to place, date, time and casualties. What to do and what *not* to do in case of an imminent tornado or warning is suggested. *Subject Headings:* **1. Tornadoes, Missouri (1957) 2. Missouri.**—*M.R.*

SUPPLEMENTARY MATERIAL

10B–160 551.507.352:551.515.3

Beebe, Robert G. (*U. S. W. B., Kansas City, Mo.*), **The 1956 Tornado Research Airplane Project ata.** *American Meteorological Society, Bulletin*, 38(10):575–578, Dec. **1957.** 2 tables, 4 refs. **DWB, DLC**—The purpose of this article is to describe the project and its objective, the kinds of ights that were made, and to summarize the kinds of data available to researchers. A summary f the flight areas, dates, times, and levels is shown in tabular form. A sample data sheet shows the ata presentation. These data may be borrowed from the U. S. Weather Bureau, Washington 25,). C. (*Same item as* 10.1–144, Jan. 1959, *MAB.*) *Subject Headings:* **1. Aircraft tornado recon-aissance 2. Tornado research airplanes.**—*Author's abstract.*

10B–161 551.515.3(74):551.509.52

Boucher, Roland J., **Synoptic and meso scale aspects of severe local storms in New England. Blue Hill Meteorological Observatory, Milton, Mass., June 30, 1958.** Sponsored in part by U. S. Veather Bureau under Contract Cwb-9271. 38 p. 17 figs., refs. **DWB** (M15.B753sy)—Severe ocal storms (damaging local windstorms and tornadoes) in New England are found to occur under ve types of synoptic situations. The incidence of SLS is well correlated to the presence of a high evel wind "jet." The distribution of SLS in New England from 1643 to 1956 reflects strongly the eterrent effect of stable "sea breeze air." The use of mesoscale synoptic analyses combined with adar echo data as an aid in SLS forecasting is demonstrated. *Subject Headings:* **1. Mesoanalysis f tornadoes 2. Synoptic conditions for severe local storms 3. Severe local storm analysis 4. Tor-adoes, New England 5. New England.**—*Author's abstract.*

10B–162 551.482.215:551.515.3

Darrieus, G. (*Compagnie Electro-Mécanique*), **Au sujet d'une observation de Colladon au Pont de la Machine à Genève.** [Observation by Colladon from the Machine Bridge at Geneva.] *Société Hydrotechnique de France, Mémoires & Travaux*, 2(2):156–159, **1954.** English summary p. 56. **DWB**—Author gives a general physical explanation of a helico-centripetal, horizontal vortex bserved in front of a dam. Diffusion of turbulence due to friction at the bottom is assumed. The uthor suggests that his explanations could as well apply to waterspouts and large diameter columns f smoke in the atmosphere, considering the earth's rotation. *Subject Headings:* **1. Whirlpools . Waterspouts.**—*A.A.*

10B–163 551.515.31(764)

Glaser, Arnold H., **Tornado studies.** Texas Agricultural and Mechanical College. Dept. of Oceanography and Meteorology, Contract Cwb 8096, Final Report, Jan. **1956.** 24 p. 22 figs., refs., 17 eqs.—Since no direct measurements of velocity or pressure distribution in a tornado have een made, or are possible at present, a theoretical model is derived from photographs of a well-eveloped funnel, and from indirect evidence. The tornado of March 21, 1956 in northern Bell ounty, Tex., taken from a distance of 2.5 km, was used for computations of dimensions and tan-ential velocities with respect to radius (which varies with height). Maximum velocity was 100 n/sec at 61 m radius and 820 m height, the velocity fell off abruptly. Cloud base was 1050 m above round. Pressure was 78 mb lower at tornado center (at 340 m height). Vorticity calculations ndicate that an area of negative vorticity surrounds the funnel. Vertical velocities are also cal-ulated and the mechanism involved suggested as a means for hail formation. Another tornado, hat near Seguin, Tex., on Oct. 20, 1956 at 1530, was peculiar in that no condensation funnel occurred, he air was dry, and dust was main visible marker of vortex. Reports and photographs, drawings, tc. of this and of one at Port Acres, Tex., on Nov. 5, 1956 (1145–1200) are included. For 3 years, he fire whirlwinds attending the annual Texas A. & M. bonfire (50′ conical stack of tree trunks) ave been carefully studied with the aid of a mobile micrometeorological truck. Ambient conditions avor inversions but strong local heating of ground results from radiation from fire and sparks and nbers carried downwind. Thus a strong superadiabatic lapse rate extends up to 15 ft where noke plume causes an intense inversion. Whirlwinds tend to form under edge of smoke plume which fluctuates over a fairly wide angle). Almost all the forms found in tornadoes were observed these fire whirlwinds. Motion was shown photographically to be always upward in center of ortex and never down from smoke plume. Motion of vortex was either cyclonic or anticyclonic ith winds up to 40 mph; temperature at center of whirl was shown to be 2°–3°C or more higher an outside. Air flow around fire and in whirl was studied by means of soap bubbles and found be inflow at surface of all sides of fire, upward spiral in and over the fire, and outward roll of smoke hich, when broken off, results in a fire whirl. *Subject Headings:* **1. Tornadoes, Texas (1956) Tornado structure 3. Dust devils 4. Fire whirlwinds 5. Bell County, Tex. 6. Sequin, Tex. Port Acres, Tex. 8. College Station, Tex.**—*M.R.*

10B–164 551.509.52:551.515.2 551.511.32-551.515.21

House, Donald C. (*Severe Local Storms Forecast Center, Kansas City, Mo.*), **Air mass modification and upper-level divergence.** *American Meteorological Society, Bulletin*, 39(3):137–143, March **1958.** 8 figs., 8 refs., 5 eqs. **DWB, DLC**—High level divergence (above 500 mb) coupled with low level convergence will produce vertical motion and result in air mass modification producing conditions favorable for severe storms or tornadoes. Examples of 3 contrasting situations are analyzed: one in autumn (Oct. 28, 1955), when there is a strong 300 mb jet stream over the Southern Plains and Mississippi Valley, and the other in the warm season (May 29, 1956) with high level streamline divergence (200 mb) rather than speed divergence; both resulting in severe storms. Actual and computed soundings are compared for stations near the severe storms and for the immediate vicinity of the storms, respectively. Dynamic cooling may offset advectional warming in such situations as represented by the second example. Modification occurs at high levels, 30–40 thousand feet in this case, but at 20–30 thousand ft in the first example. (*Same item as* 10.1–170, Jan. 1959, *MAB.*) *Subject Headings:* **1. Severe storm forecasting 2. Tornado forecasting 3. Upper level divergence effects 4. Air mass modification.**—*M.R.*

10B–165 551.515.3

Rossmann, Fritz O., **Differences in the physical behaviour of tornadoes and waterspouts.** *Weather*, London, 13(8):259–263, Aug. **1958.** 2 photos, 13 refs. Also: Feteris, P. J., **Tornadoes and waterspouts.** *Weather*, 13(12):426–427, Dec. **1958.** 4 refs. **DWB**—Author offers a solution of the frequency and development of waterspouts around the Caribbean and Mediterranean sea coasts. The characteristic similarities and differences between tornadoes and waterspouts are considered in the introduction. When the cumulonimbi of the heavy over-land developed thunderstorms feeding on moist sea breeze drift over the sea, they encounter nearly saturated air. The incipient vortices generate within the cloud due to hail, the pushing action of which causes condensation around the axis of rotation as a function of pressure drop; and thus a waterspout is brought into existence. Feteris criticizes Rossmann's theory on the grounds that since "even many vigorous cumulonimbus clouds which produce strong downdroughts, thunder and hail, show no signs of tornado or waterspout formation, it is difficult to imagine that the much weaker storm clouds observed over the sea should be accompanied by waterspouts." Feteris believes that Koschmieder's theory, which requires no form of precipitation, is more realistic than Rossmann's suggestion. *Subject Headings:* **1. Waterspout formation 2. Tornado theories.**—*W.N.*

10B–166 551.515.3:598.2

Rossmann, Fritz O. (*Alamogordo, N. Mex.*), **Tornado effect on birds.** *British Ornithologists' Club, Journal*, 78(2):44-45, Feb. **1958.** 4 refs. Abstracted from separated sheets. Bound in folder with this: Trans. into German, issued to *Ornithologische Mitteilungen*, Stuttgart, Vol. 10, **1958.** **DWB** (M15.3 R837to)—A number of quotations from Loomis (1837 and 1842), Olmstead (1839) and Hazen (1890) are included in this brief article on the stripping of feathers from domestic fowls by forces operating in tornadoes. Wind and pressure change effects are considered. *Subject Heading:* **1. Tornado effects on birds.**—*M.R.*

10B–167 551.509.52:551.515.3:551.511.33

§Whitney, Linwood F., Jr., and Miller, James E. (*both, New York Univ.*), **Destabilization by differential advection in the tornado situation of June 8, 1953.** *American Meteorological Society Bulletin*, 37(5):224–229, May **1956.** 6 figs., 9 refs. **DWB**—The processes involved in the destabilization and increase in instability due to advection of cold air aloft or warm moist air in lower levels are explained and illustrated diagrammatically, and the situation on June 8, 1953 analyzed by means of 850, 500 and 300 mb charts to show how differential advection produced a strong area of instability at a very low level and net available energy from 850 mb to 300 mb over the lower Lakes region where a number of devastating tornadoes occurred that evening. On the following day the tornadoes occurred in New England, but the criteria did not fit so well. *Subject Headings:* **1. Destabilization by differential advection 2. Tornado forecasting 3. Differential advection** —*M.R.*

10B–168 551.515.

Battan, Louis J. (*Univ. of Chicago*), **Energy of a dust devil.** *Journal of Meteorology*, Boston 15(2):235–237, April **1958.** fig., table, 7 refs. **DWB, DLC**—In this analysis of the energy transformations of dust devils it is assumed that the system in which the dust devil forms has rigid walls and that the top of the column within which the whirl forms is capped by a weightless piston. The procedure then involves the calculation of the so-called "total heat," i.e., the sum of internal and potential energy (including that of the piston) of the column of air before and after the dust devil occurs. The change of total heat may be equated then to the change of kinetic energy. In order to calculate the amount of energy available for conversion into kinetic energy the most important

equirement in determining the final temperature structure, which initially was superadiabatic, that the overturning be isentropic. Calculations were made for model I for which it was assumed hat overturning was complete and for model II for which the overturning was isentropic, and the nal lapse rate was equal to the day adiabatic lapse rate. Internal energy was calculated by $=C_2\int Tdm+const.$, potential energy $P=R\int Tdm+const.$, and $I+p=C_2\int Tdm+const.$ Calculations profile velocities and pressure in a dust devil indicate that the kinetic energy of the dust devil sults from a reduction of the internal and potential energy of the air involved. *Subject Headings:* **Thermodynamics of whirlwinds 2. Dust devil models.**—*I.L.D.*

10B–169 551.515.3(784)

Fujita, Tetsuya, **Analysis of the Fargo tornado of June 20, 1957.** Chicago. Univ. Dept. of leteorology, Contract Cwb-9321, Preliminary Technical Report, No. 5, Aug. **1958.** 4 p. 9 figs., ible. **DWB** (M15 C532fin)—The Fargo tornado was a very interesting and valuable storm for the udy of a tornado and its environment, because the large mass of the rotating cloud was photo- raphed long before the funnel dropped from the base of that cloud. Actually about 30 single frames nd one 40 sec. motion picture were taken, which show the structure of the cloud. At least three onfirmed tornadoes occurred inside the narrow zone swept by the rotating cloud, about 10 mi in ameter. The second tornado which moved over the residential district of Fargo was photographed its entire life time. The proposed study of this tornado will cover the analysis of features in three fferent scales, the tornado funnel itself, the rotating cloud system from which the tornado emerged nd the mesoscale thunderstorm systems. The work is now in progress and it will be completed in he 1958–59 fiscal year. *Subject Headings:* **1. Tornado analysis 2. Tornado photographs 3. Tor- ado, Fargo (June 1957) 3. Fargo, N. Dak. I. Chicago. Univ. Dept. of Meteorology II. Contract wb-9321.**—*Author's abstract.*

10B–170 551.515.3(781)

Jackson, Robert (*Kansas City*) and Bigler, Stuart G. (*Dept. of Oceanog. and Met., Texas A. & M. ollege*), **Inside the Kansas City tornado.** *Weatherwise*, Boston, 11(3):88–90, June **1958.** 3 photos. **WB**—This is a summary of a narrative by R. Jackson (De Backer Chevrolet Co.), of his observa- ons made inside the funnel of the Kansas City tornado of May 20, 1957. The account includes a escription of the inside of the funnel where no whirling motion could be seen. *Subject Headings:* **Tornado, Kansas City (May 1957) 2. Kansas City, Mo.**—*G.T.*

10B–171 551.509.52:551.515.3/4

Knox, John L., (*Toronto/Malton Forecast Office*), **The severe local storm centre at Kansas City.** *oyal Meteorological Society, Canadian Branch, Publication*, 8(5):35–51, Nov. **1958.** 3 figs. **DWB**— he history of tornado forecasting in the U. S. is traced with some brief reference to tornado clima- logy. The SELS unit organization is discussed with reference to such ancillary features as: the . S. Radar Network; the Radar and Weather Warning Teletype Circuit; Nonscheduled Radiosonde ights; State Police Cooperation; and the relationship between the SELS Unit, the District and ocal Forecast Offices and the consumer. Principle techniques used in Severe Weather Forecasting e surveyed and illustrated by the situation on May 22, 1957 when a severe weather warning was sued by the Malton DPWO. The work of the SELS Unit is evaluated with particular reference those procedures of greatest interest to Canadian Forecast Offices. *Subject Heading:* **1. Severe ocal Storm Forecasting Center.**—*Author's abstract.*

10B–172 551.515.3(438.2)

Parczewski, Władysław, **Traba wodna w Łebie.** [Waterspout at Łeba.] *Gazeta Obserwatora IHM*, Warsaw, 11(5):7–8, May **1958.** fig., table. **DLC**—A waterspout observed at Leba on the altic Sea coast on Sept. 21, 1957 at 18.03 o'clock appeared first in the form of a narrow (30–40 cm) nnel under a cumulonimbus cloud mass. Its gradual development, descent, extension in width 00–150 m), breaking up and disappearance are described. A second funnel of a much lighter color peared 4 min later. It lasted 7 min and disappeared after breaking in two at the middle. De- iled information on cloudiness, wind speed and direction, air temperature and humidity, amount d kind of precipitation, as well as a chart of the atmospheric situation on that day, are included. *ubject Headings:* **1. Waterspouts 2. Łeba, Poland.**—*A.M.P.*

10B–173 551.515.3(438.1)

Rafałowski, Stanisław, **Trąby w Rawie Mazowieckiej i w Nowym Mieście, maj 1958 r.** [Tor- does at Rawa Mazowiecka and Nowe Miasto, May 1958.] *Gazeta Obserwatora, PIHM*, Warsaw, (6):7–10, June **1958.** 7 figs. **DLC**—On the morning of May 16, 1958, the State Hydrological and eteorological Institute in Warsaw was flooded with telephone inquiries about the tornado disaster at hit the two above named cities on the preceding evening. Having received no information om its network of stations, the Institute sent two employees by car to find out the details. In this

eye witness report, the author describes the devastation produced by the storm on a 13 km long and 300-1000 m wide path near Rawa Mazowiecka and 10 km long and 200 m wide path at Nowe Miasto where the climatological station was demolished. On the basis of information received from local inhabitants, the author concluded that these were typical tornadoes with cyclonic direction of vortexes, that lasted 10–15 min with thunderstorms (hail stones at the beginning). Two charts showing the paths of tornadoes in both localities and several photographs of devastation caused are included. *Subject Headings:* **1. Tornadoes, Poland (May 1958) 2. Poland.**—*A.M.P.*

10B–174 551.515.3/4

†U. S. Weather Bureau, **Causes and characteristics of thunderstorms and other atmospheric disturbances.** 10th Interim Report, submitted in accordance with public law 657, 80th Congress. Wash., D. C., July **1958.** 57 p. 25 figs., table, 39 foot-refs., 36+21 refs. **DWB** (M15.4 U587ia)—The report is divided into three major sections with primary emphasis being placed on studies of hurricanes and tornadoes. The first section reviews the progress and future plans of the National Hurricane Research Project. The second section reviews the severe local storm problem, outlining the progress made during the past year and the need for expansion of this important phase of meteorological research. Included in this section is a review of the experimental use of Doppler radar to detect tornadoes. The third section outlines briefly the progress being made in other phases of meteorological research, including the use of earth satellites for meteorological purposes. (For earlier reports, *see* 3.5–151, May 1952, 4.4–119, April 1953, 6.11–205, Nov. 1955 and 10B–113 [this issue], *MAB.*) *Subject Headings:* **1. Hurricane research projects 2. Tornado research projects 3. Satellite uses.**—*From authors' introduction.*

10B–175 551.515.3:551.594.21

Vonnegut, Bernard and Moore, Charles B., **Giant electrical storms.** Arthur D. Little, Inc. Contract Nonr-1684(00), (Unnumbered report), March 15, **1958.** 21 p. 6 figs., table, 28 refs. **DWB** (M15.4 V947gi)—The storms that produce tornadoes are generally more vigorous, larger, and more electrically active than ordinary thunderstorms. Not only do they give a far higher frequency of lightning strokes, but they also exhibit a variety of luminous electrical phenomena unknown in common storms. A remarkable feature is that they frequently penetrate well into the stratosphere, reaching heights of 20 km or more. To do this, they must have vertical velocities of about 100 m sec^{-1}. The very low temperature in the upper half of these storms apparently precludes electrification mechanisms in this region involving liquid water or precipitation formation. *Subject Headings:* **1. Tornado electricity 2. Electrical phenomena in tornadoes.**—*Authors' abstract.*

10B–176 551.515.3(749)

Whiteley, George, **Weatherman sees twister.** *Weatherwise,* Boston, 11(4):133, Aug. **1958. DWB**—The author had the rare opportunity of seeing a tornado on Friday, June 13, 1958, at 5:20 p.m. at his home in Bordentown Township, N. J. The funnel stretched from the ground to 2,000 ft and cut a mile long path which passed within 300 yds of his home, moving west to east. Winds were estimated at 200–300 mph and the funnel moved at about 50 mph. The path was 100–200 yds wide and the tip rose and fell as it moved along. *Subject Headings:* **1. Tornado, Bordentown Township, N. J. (June 1958) 2. Bordentown Township, N. J.**—*M.R.*

10B–177 551.515:551.501.81

§Fujita, Tetsuya, **Study of mesosystems associated with stationary radar echoes.** Chicago Univ. Dept. of Meteorology, Contract Cwb-9321, Technical Report, No. 1, Feb. **1958.** 13 p. 18 figs., 12 refs. **DWB** (M15 C532fin)—Mesosystems associated with stationary radar echoes were analyzed. Five of them occurred on July 20, 1956 over the area of the U. S. Weather Bureau's Severe Local Storms Network, and they grew to 300–400 mi in diameter. Divergence and vorticity at each 1,000 ft level inside a composite mesosystem were computed up to 5,000 ft. It is found that the wind field is rotational up to 3,000 ft where it becomes irrotational. Appreciable divergence reaching over 100×10^{-5} per sec on the ground decreases linearly to 30×10^{-5} per sec at the 5,000 ft level. Computed vertical velocity inside the mesosystems was about 1 ft per sec at 1,000 ft, reaching 3 ft per sec at the 5,000 ft level. A small system of Aug. 13, 1947 over the Thunderstorm Project area was also studied; it was only 20 mi in diameter. Comparison of the characteristics of these systems indicated that the systems, large and small, may be produced by similar processes. *Subject Headings:* **1. Radar echoes from mesosystems 2. Mesoanalysis.**—*Author's abstract.*

10B–178 551.515.8

§Brown, Henry A., **Analysis of a squall line: a line series of mesosystems in different states of development.** Chicago. Univ. Dept. of Meteorology, Contract Cwb-9321, Technical Report No. 2, June **1958.** 29 p. 38 figs., 14 refs. **DWB** (M15 C532fin)—As an addition to previous knowledge concerning the life history of squall lines, a study was made, using mesometeorological

echniques, of the severe weather that formed over the area of the Severe Storm Network in Texas n March 31–April 1, 1955. Results show that a cold front moving into central Texas and Oklahoma vas preceded by severe weather which was initiated along a curved line extending from northern Oklahoma into south central Texas. This activity in its early stages of development consisted of mall systems which first appeared along the northern portion of the front. These small systems hen grew in size to the dimensions considered to be mesoscale. Activity was initiated in a progres- ive manner from the northern to the southern portion of the front. In this manner, the severe veather, which moved ahead of the cold front, consisted of numerous mesosystems representing progressive stages of development and forming an almost continuous line of activity. *Subject Headings:* **1. Mesoanalysis of squall lines 2. Squall lines.**—*Author's abstract.*

10B–179 551.515.41:551.577

Fujita, Tetsuya, **Precipitation and cold-air production in meso-scale thunderstorm systems.** Chicago. Univ. Dept. of Meteorology, Contract Cwb-9321, Technical Report, No. 3, June **1958.** 7 p. 13 figs., 3 tables, 28 eqs. **DWB** (M15 C532fin)—This paper presents a proposed mechanism of cold air production associated with precipitation. A dome of cold air is produced by the evapora- ion of raindrops falling beneath the cloud base. A quantitative relationship between the evaporated ain and the produced excess mass of cold air was obtained, which showed that the mass is directly proportional to the evaporation. The coefficient of proportionality is a dimensionless number vhich varies between 0 and 1 depending on the temperature lapse rate originally existing beneath he cloud base. Results of mesoanalyses of squall lines and thunderstorms were used to estimate the ctual amount of evaporation. The mass ratio of evaporated rain to the surface rain was found o increase with the height of the cloud base, reaching 1.0 at a cloud base of 9,000 ft. In-cloud vaporation obtained by BRAHAM (1952) showed a very good agreement with the values obtained in his study. *Subject Headings:* **1. Evaporative cooling 2. Evaporation of raindrops 3. Thunder- storm dynamics. I. Contract Cwb-9321.**—*Author's abstract.*

10B–180 551.515.3/4

§Omoto, Yukio, **Study of outbreaks of severe local storms near dry fronts.** Chicago. Univ. Dept. of Meteorology. Contract Cwb-9321, Technical Report, No. 4, Aug. **1958.** 18 p. 17 figs., able, 9 refs. **DWB** (M15 C532fin)—A case study of an outbreak of severe local storms on Dec. 4, 956 in the central Mississippi Valley is presented. It is found that there was a distinct boundary etween moist air and dry air in the vicinity of the storm area. The boundary was moving toward he moist air and is called the dry front in this paper. Through the investigation of the behavior f this dry front, it is concluded that this front played an important role in the outbreak of the severe ocal storms. In order to see the relationship between dry fronts and formation of severe local storms he structure and behavior of the dry fronts are discussed more generally. It is found that the irculation which maintains the distinct boundary between moist and dry air for a considerable ength of time gives rise to the outbreak and the development of severe local storms under favorable onditions. *Subject Headings:* **1. Severe storm analysis 2. Synoptic conditions for severe local torms.**—*Author's abstract.*

10B–181 551.515.4

Tepper, Morris, **Tornadoes.** *Scientific American*, N. Y., 198(5):31–37, May **1958.** 19 figs. incl. photos). **DWB, DLC**—A report on the tornadoes that hit the shore of Lake Michigan and ther areas of the United States, as well as the bordering Canadian towns during 1957. The year aw 924 tornadoes in the U. S. with 191 persons killed, 2,343 injured and more than $73 million lost n property damage. The worst tornado in the history of the U. S. occurred on March 18, 1925, n Missouri, lower Illinois and Indiana for 3 hours during which 689 people died. This paper explains he development of tornadoes and calls for an effective system of tornado detection and warning vhich will alert the people in the path of a tornado as soon as one actually springs up. *Subject Headings:* **1. Tornado damage statistics 2. United States.**

PART III. REVIEWS, RECENT MONOGRAPHS AND ANALYTICS FROM SERIALS AND COLLECTED WORKS

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PERIODICALS IN WHICH METEOROLOGICAL ARTICLES REGULARLY APPEAR

★**Acta Geophysica Polonica,** [Warsaw].
Akademiia Nauk SSSR, Izvestiia, Ser. Geogr. and **Ser. Geofiz.,** [Moscow].
American Geophysical Union, Transactions, [Washington].
★**American Meteorological Society, Bulletin,** [Boston].
★**Angewandte Meteorologie,** [Potsdam].
Annales de Géophysique, Centre National de la Recherche Scientifique, [Paris].
★**Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A and Ser. B,** [Vienna].
Australian Journal of Physics, [Melbourne].
★**Australian Meteorological Magazine,** [Melbourne].
★**Ciel et Terre,** Société Belge d'Astronomie, Météorologie et Physique du Globe, [Brussels].
★**Geofisica e Meteorologia,** Società Italiana di Geofisica, [Genoa].
Geofisica Pura e Applicata, Istituto Geofisico Italiano, [Milan].
★**Geophysical Magazine,** Japan Meteorological Agency, [Tokyo].
Hemel en Dampkring, [The Hague].
★**Időjárás,** Magyar Meteorológiai Társaság and Országos Meteorológiai Intézet, [Budapest]
★**Indian Journal of Meteorology and Geophysics,** [Delhi].
★**Journal of Atmospheric and Terrestrial Physics,** [London].
Journal of Geophysical Research, [Washington].
★**Journal of Meteorological Research,** [Tokyo].
★**Journal of Meteorology,** American Meteorological Society, [Boston].
★**Journal Scientifique de la Météorologie,** Société Météorologique de France, [Paris].
★**The Marine Observer,** Air Ministry, Meteorological Office, London.
★**The Meteorological Magazine,** Air Ministry, Meteorological Office, London.
★**Meteorologické Zprávy** [Prague].
★**Meteorological Society of Japan, Journal,** [Tokyo].
★**La Météorologie,** Société Météorologique de France, [Paris].
★**Meteorologiia i Gidrologiia,** [Leningrad].
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★**Monthly Weather Review,** U. S. Weather Bureau, Washington, D. C.
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★**Rivista di Meteorologia Aeronautica,** Servizio Meteorologico, [Rome].
★**Royal Meteorological Society, Quarterly Journal,** [London].
★**South Africa, Weather Bureau, Notos,** [Pretoria].
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★**Weather,** Royal Meteorological Society, [London].
★**Weatherwise,** American Meteorological Society, [Boston].
★**Wetter und Leben,** Österreichische Gesellschaft für Meteorologie, [Vienna].
★**WMO Bulletin,** World Meteorological Organization, [Geneva].
★**Zeitschrift für Meteorologie,** Meteorologisches Observatorium, Potsdam.

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